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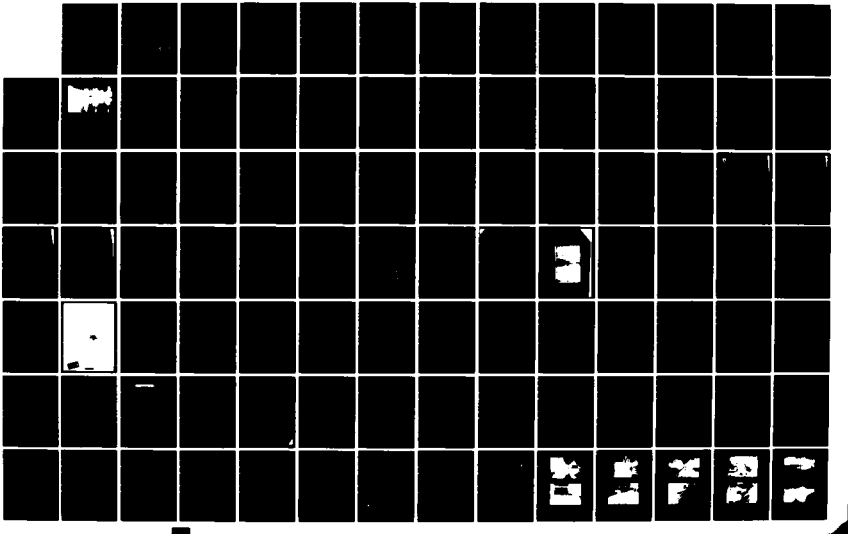
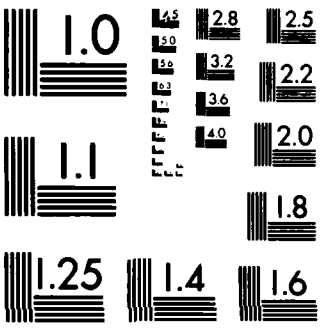




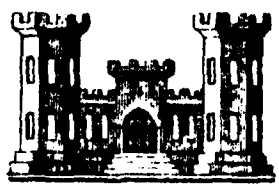
AD-A153 741

CONNECTICUT RIVER BASIN

SOUTH HADLEY, MASSACHUSETTS

LEAPING WELL RESERVOIR
MA 00586

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JUNE 1981

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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
South Hadley, Massachusetts
Leaping Well Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is and "L" shaped, 480 ft. long earthfill embankment containing an inclined brick membrane about 2 ft. below the surface of upstream slope. The size is small and the hazard potential is high. Based on these classifications the test flood is the Probable Maximum Flood.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

SEP 11 1981

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Leaping Well Reservoir Dam (MA-00586) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Leaping Well Reservoir Dam would likely be exceeded by floods greater than one percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam classified as high hazard with a spillway capacity insufficient to discharge fifty percent of the PMF be judged as having a seriously inadequate spillway. As a result this dam is assessed as unsafe, non-emergency until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as it would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

We recommend that within twelve months from the date of this report the owner of the dam engage the services of a qualified registered engineer to determine further the potential of overtopping the dam and the need for and the means to increase project discharge capacity. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed and round-the-clock surveillance should be provided during periods of heavy precipitation or high project discharge.

SEP 11 1981

NEDED
Honorable Edward J. King

I approve the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the program.

Copies of this report have been forwarded to the Department of Environmental Quality Engineering and to the owner, South Hadley Water Department. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Quality Engineering for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

"Original contains color plates: All DTIC reproductions will be in black and white"

LEAPING WELL RESERVOIR

MA 00586

CONNECTICUT RIVER BASIN
SOUTH HADLEY, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No: MA00586

Name of Dam: Leaping Well Reservoir Dam

Town: South Hadley

County and State: Hampshire County, Massachusetts

Stream: Leaping Well Brook

Date of Inspection: March 5, 1981

Leaping Well Reservoir Dam is an L-shaped, 480-foot long earthfill embankment containing an inclined brick masonry membrane about 2-feet below the surface of upstream slope. The main leg of the dam runs east to west, parallel to Route 202, and is approximately 278 feet long. The northerly leg is 6 feet high at the east and tapers to grade at the west end. Route 202 lies between the downstream discharge pipes and the main embankment. Including Route 202, the total height of the embankment is 29 feet. A second leg of the dam, approximately 2 to 5 feet higher than the abutting residential properties, turns at an angle of 90° away from Route 202 and continues toward the south before blending into the current landscape. The crest of the east embankment is 6 feet above the reservoir level. Normal outflow from the reservoir occurs through a 12-inch gated pressure conduit. The brick and wood frame gatehouse was formerly used to house the discharge controls but is presently used as an inlet structure only. A 12-inch diameter inlet to a chamber in the gatehouse acts as the high water outlet. Discharge from the chamber is through a 24-inch outlet pipe which flows under Route 202. Both outlet pipes discharge to Leaping Well Brook on the northwesterly side of Route 202. With the water surface at the top of the dam, the storage capacity of the reservoir is 140 Acre-Feet. Presently, the reservoir is not being utilized for any specific purpose and is partially enclosed by a chain link fence to restrict unauthorized access to the impoundment.

The following deficiencies were observed at the site: four non-functioning gates within the gatehouse; deterioration of the brick masonry foundation of the gatehouse; poor condition of the access footbridge to the gatehouse; presence of root growth along the dam; minor erosion of the downstream face of the east embankment; and the presence of a 12-inch pressure conduit through embankment. Generally, the dam is in fair condition.

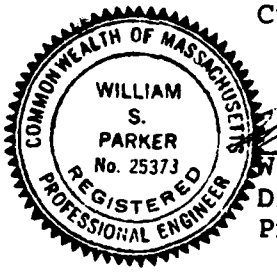
Based on size classification, small, and hazard potential, high, in accordance with the Corps of Engineers Guidelines, the adopted test flood is the Probable Maximum Flood. Hydraulic analyses indicate that the test flood would result in a peak inflow of

580 cfs, a peak outflow of 470 cfs, and that the conventional outlets can discharge 3% of the test flood outflow. The recommended test flood would result in a maximum water surface elevation of 216.3, which represents an overtopping of the dam by 0.3 feet.

It is recommended that the Owner retain a qualified Registered Professional Engineer to prepare plans for restoring the brick foundation of the gatehouse, strengthening or replacing the footbridge, providing upstream control on the 12-inch outlet, removing trees and stumps, and designing slope protection for both upstream and downstream faces of the north and east embankments. A qualified Registered Professional Engineer should also be retained to perform a detailed hydrologic/hydraulic investigation to assess further the potential of overtopping the dam and the need for the means to increase project discharge capacity. In addition, the Owner should repair the deficiencies listed above, as described in Section 7.3. It is also recommended that the Owner establish a plan for surveillance of the dam during and after periods of heavy rainfall, a plan for notifying downstream residents in the event of an emergency at the dam, and a program of annual technical inspections by a qualified Registered Professional Engineer.

The measures outlined above and in Section 7, with the exception of an Emergency Action Plan, should be implemented by the Owner within a period of one year after receipt of this Phase I Inspection Report. Formulation of an Emergency Action Plan as outlined in Section 7, should be commenced immediately upon receipt of this Report.

Cullinan Engineering Co., Inc.



William S. Parker, PE
Director of Engineering
Project Manager

This Phase I Inspection Report on Leaping Well Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm run-off), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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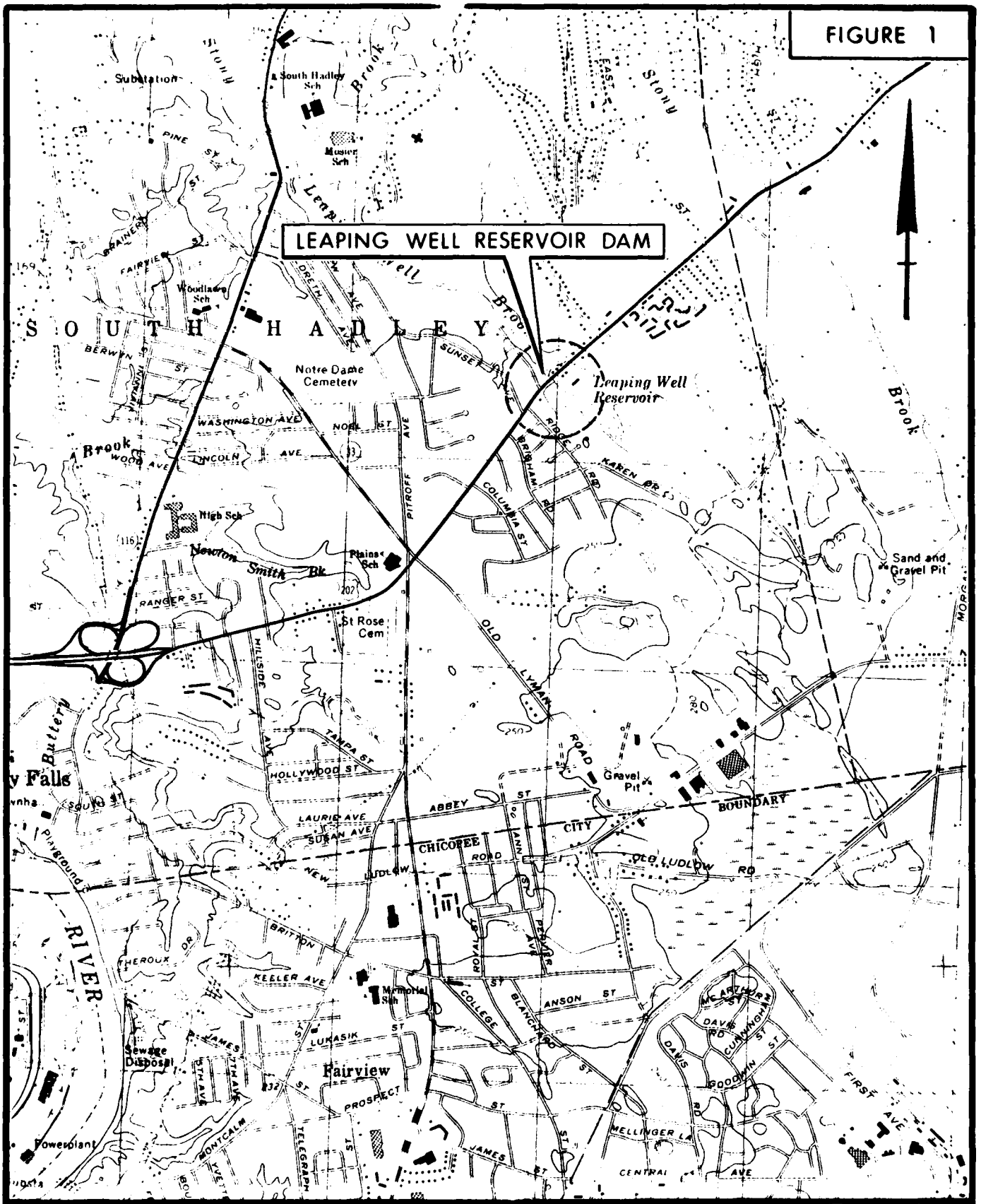
OVERVIEW

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

FIGURE 1



LOCATION MAP

LEAPING WELL RESERVOIR DAM
SOUTH HADLEY , MASS.
1" = 2083'

CULLINAN ENGINEERING CO., INC. SPRINGFIELD NORTH, MASS QUADRANGLE 1979

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

LEAPING WELL RESERVOIR

SECTION 1

PROJECT INFORMATION

1.1 General

(a) Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cullinan Engineering Co., Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW-33-81-C-0025, dated December 19, 1980, has been assigned by the Corps of Engineers for this work.

(b) Purpose:

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate, quickly, effective dam safety programs for non-Federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

(a) Location. Leaping Well Reservoir Dam is located at the headwaters of Leaping Well Brook on the southeasterly side of Route 202 in the Town of South Hadley, Hampshire County, Massachusetts (see Location Map). The coordinates of the dam are latitude 42 degrees 14.0 minutes north and longitude 72 degrees 33.8 minutes west. Discharge from Leaping Well Dam flows downstream approximately 3 miles before reaching the Connecticut River.

(b) Description of Dam and Appurtenances. Leaping Well Reservoir Dam consists of an earth embankment with a brick masonry waterstop, a gatehouse, and a 12-inch diameter gated pipe outlet and a 24-inch diameter ungated overflow outlet.

Leaping Well Reservoir Dam is a 480 foot long, 29 foot high L-shaped earthfill embankment containing an inclined brick masonry membrane about 2 feet below the surface of the 2:1 upstream slope as indicated on the original design plans of 1891 (see Appendix B). Subsequent insepction reports by the Massachusetts Department of Public Works verify the existence of the water stop. The main leg of the dam runs east to west, parallel to Route 202, has an 8 foot wide grass covered crest at El 216.0, and is approximately 278 feet long. At the east end the northerly leg is 6 feet high and tapers to grade at the west end. Route 202 lies between the downstream discharge pipes and the main embankment. On the downstream side of the north embankment is a 1.5:1 slope down to the roadway (Route 202) at El 210.0±. Including sidewalks, shoulders and travelled way, the roadway is 55-feet wide. Across the roadway from the dam a 2:1 grass covered slope descends to Leaping Well Brook, the natural channel where the dam outlets discharge. The highway embankment improves the stability of the north embankment.

A second leg (referred to as the east embankment) turns at an angle of 90° away from Route 202 and continues toward the south before blending into the current landscape. This portion of the embankment curves around the east edge of the reservoir, approximately 3 to 5 feet higher than abutting residential properties. The crest of the east embankment is 6 feet above the reservoir level. Both the upstream face of the east embankment and the north embankment are grassed without slope protection and are free of all but small brush and grass-type vegetation (see Photo No. 1). Gradually diminishing to the south, away from Route 202, the east embankment blends into residential land previously filled to the elevation of the dam. Further south along the east boundary, a slight soil berm redevelops, approximately 1 to 3 feet higher than the filled land to the east. Along this stretch, the dam is heavily covered with small trees and roots, and consists of crudely mounded earth with no slope protection.

The gatehouse structure is located in the reservoir about 30 feet from the top of the upstream slope (see Photos No's. 1, 2 and 3). Access to the gatehouse is by means of a wooden footbridge. The gatehouse has a wood frame superstructure and a round brick foundation divided into 4 inlet chambers which were controlled by valves within the gatehouse. Valve control mechanisms have since been dismantled and are no longer functional. It is reported that the valves on the 24-inch and 12-inch outlet lines within the gatehouse are in the open position. The remaining valves are assumed to be in the closed position. As there is no spillway structure for the dam, normal procedure is to regulate the reservoir level with the 12-inch discharge pipe. A large opening approximately 24 inches wide and of undetermined height (in excess of 3-feet) supplies the 12-inch outlet, which then flows diagonally across Route 202 in a westerly direction to a manhole at the site of the former pumphouse, where it

is controlled by a gate valve within the structure (see Photo No. 6). Generally, this valve is closed. However, as the only control on this outlet is located on the downstream side of the dam, the 12-inch pipes act as a pressure conduit through the embankment. From the manhole the outlet flows in a northeasterly direction to its point of discharge at Leaping Well Brook.

The 24-inch outlet pipe, which has an invert elevation of 188.0, functions as a high water overflow discharge line and is supplied by a 12-inch diameter inlet pipe through the brick foundation at invert El 212.0. The 24-inch iron outlet pipe passes under Route 202 from the gatehouse and discharges at Leaping Well Brook. In 1973 the discharge end of the outlet pipe collapsed. A repair was made by excavating back along the pipe 18 to 20 feet to a section of sound pipe. It was reported that at this point the pipe appeared to be less than a 24-inch diameter. The repair was made by wedging a 12-inch well casing into the pipe, packing the joint with a sealing compound, and encasing the joint in a concrete collar (see Appendix B, Pages B-16 and B-17). Leaping Well Brook, the discharge channel for the reservoir outlets, is a very narrow, meandering water course.

Since the mid 1950's the reservoir has not been used for a water supply by the Town of South Hadley. Access to the reservoir is restricted by a 6-foot high chain link fence which encompasses a major portion of the impoundment area.

(c) Size Classification. The maximum height of the dam is approximately 29 feet and the estimated total storage capacity at the top of the dam is 140 acre-feet. According to guidelines established by the Corps of Engineers, the dam is classified in the "small" category on both height and storage capacity.

(d) Hazard Classification. There are two possible modes of failure which could occur at Leaping Well Dam. The first potential failure would include only that portion of the dam embankment above Route 202. The resultant failure outflow would severely damage Route 202 and cause flow depths of approximately 2 feet to 4 feet at as many as 7 homes and businesses that were not subject to any flow (from the dam) prior to failure, thereby creating the potential for severe economic loss and the possible loss of more than a few lives. The second possible failure mode would encompass the breaching of the total embankment, including Route 202. Failure outflow in this case would endanger downstream dwellings and residents with 5 buildings that were not subject to any flooding prior to failure being inundated by approximately 5 feet to 10 feet of water, and with Route 116 being overtopped by approximately 5 feet, thereby causing severe economic loss and a potential loss of more than a few lives. For the purposes of this report, failure of the total embankment was chosen for the calculation of the failure outflow and dam failure flood limits. Under either mode of failure, the dam would be classified in the "high" hazard category.

(e) Ownership. The dam is owned by the South Hadley Water Department, District No. 1, 24 Bridge Street, South Hadley, Massachusetts 01075. The owner is represented by Mr. John Waller, Superintendent of the South Hadley Water Department.

(f) Operator. The dam is operated by personnel from the Town of South Hadley Water Department.

(g) Purpose of the Dam. The dam was originally designed and built as part of the water supply system for the Town of South Hadley, Massachusetts. The reservoir has not been used as a water supply since the mid-1950's. Presently, the reservoir is not being utilized for any specific purpose and is partially enclosed by a chain link fence to prevent unauthorized access to the facility.

(h) Design and Construction History. Leaping Well Dam was designed by W.W. Stong, Civil Engineer, in 1891. A copy of the design plan was obtained from the Town of South Hadley Water Department. It is assumed that the dam was constructed in the early 1890's. Field inspections indicate that the dam was constructed essentially as shown on the original plan.

(i) Normal Operating Procedure. Under normal conditions, the 12-inch outlet is used to regulate the water level of the impoundment. When the water level in the impoundment rises to El 211 (1 foot below the 12-inch overflow invert), the valve for the 12-inch outlet is opened until the level drops to El 210 (2 feet below the 12-inch outflow invert). In general, the 12-inch valve is closed. It is reported that the gate is opened prior to periods of heavy runoff to provide additional storage area. The 24-inch outlet operates only during high flow periods.

1.3 Pertinent Data

A roadway elevation of 210± for Route 202 as shown on the USGS Springfield, North Quadrangle, Massachusetts was used to develop the dam sketches and related computations. All other elevations given in this report were estimated from the assumed roadway elevation. Elevations refer to National Geodetic Vertical Datum (NGVD) formerly referred to as Mean Sea Level.

(a) Drainage Area. The drainage area tributary to the dam is 0.27 square miles. The reservoir is surrounded by rolling terrain, with about 30 percent of the watershed area being developed. Total upstream ponds and marshlands account for about 1.7 percent of the drainage area.

(b) Discharge at the Dam Site. Normally, water is drawn off from the reservoir through the 12-inch gated outlet. The 24-inch outlet functions only when the water level in the reservoir is above normal. However, there is usually a light flow through the overflow outlet due to seepage through the brick inlet chamber walls. The estimated total discharge from the outlet pipes with the water level at the top of the dam is 15 cfs. Normally, the reservoir level is maintained at El 210.

The following is a list of pertinent values relative to discharge:

1. Outlet Works (conduit) Size: 24" (controlled by 12" inlet to wet well)
   12" (gated)
   Openings and pipes in gate structure allow flow into wet well from which these pipes outlet.

   Invert Elevation: 188.0 (12" inlet to wet well at El 212.0)

   Discharge Capacity: Assumed outlet control (see calcs.)

2. Maximum Known Flood at Dam Site: Unknown

3. Ungated Outlet Capacity at Top of Dam: 7 cfs
   Elevation: 216

4. Ungated Outlet Capacity at Test Flood Elevation: 8 cfs
   Elevation: 216.3

5. Gated Outlet Capacity at Normal Pool Elevation: N/A
   Elevation:

6. Gated Outlet Capacity at Test Flood Elevation: 8 cfs±
   (outlet structure gates closed)
   Elevation: 216.3

7. Total Outlet Capacity at Test Flood Elevation: 16 cfs
   Elevation: 216.3

8. Total Project Discharge at Top of Dam: 15 cfs
   Elevation: 216

9. Total Project Discharge at Test Flood Elevation: 470 cfs
   Elevation: 216.3

(c) Elevation - Feet Above Mean Sea Level

1. Streambed at Toe of Dam: 187.5
2. Bottom of Cutoff: Unknown
3. Maximum Tailwater: Unknown
4. Normal Pool: N/A
5. Full Flood Control Pool: N/A
6. Spillway Crest: N/A
7. Design Surcharge (Original Design): Unknown
8. Top of Dam: 216
9. Test Flood Surcharge: 216.3
10. Other: 12" Overflow at El 212.0

(d) Reservoir - Length in Feet

1. Normal Pool: 1980 feet
2. Flood Control Pool: N/A
3. Spillway Crest Pool: N/A
4. Top of Dam: 2300 feet
5. Test Flood Pool: 2350 feet

(e) Storage - Acre-Feet

1. Normal Pool: 92 acre-feet
2. Flood Control Pool: N/A
3. Spillway Crest Pool: N/A
4. Top of Dam: 140 acre-feet
5. Test Flood Pool: 142 acre-feet±

(f) Reservoir Surface - Acres

1. Normal Pool: 8.5 Acres
2. Flood Control Pool: N/A
3. Spillway Crest: N/A
4. Test Flood Pool: 8.5 Acres
5. Top of Dam: 8.5 Acres

(g) Dam

1. Type: Earthfill
2. Length: 480 feet
3. Height: 29 feet
4. Top Width: 8 feet (upper embankment)
   55 feet (roadway)
5. Side Slopes: 2:1 Upstream
   1.5:1 Downstream
   2:1 Downstream (roadway)
6. Zoning: Inclined brick membrane on upstream slope
7. Impervious Core: None
8. Cutoff: Sheeting (See Plan in Appendix B)
9. Grout Curtain: None
10. Other: N/A

(h) Diversion and Regulatory Tunnel N/A

(i) Spillway None

(j) Regulating Outlets

1. Invert: (a) 188.0
(b) 212.0

2. Size: (a) 12" (gated)
(b) 12" high level inlet to wet well

3. Description: (a) Outlet from wet well; flow into wet well is through several cracks and openings in foundation wall.
(b) 12-inch inlet controls flow into wet well and 24-inch outlet from wet well.

4. Control Mechanism: (a) Gate valve in manhole on other side of Route 202.
(b) None

5. Other: N/A

SECTION 2
ENGINEERING DATA

2.1 GENERAL

A copy of the original design plan entitled "Reservoir Dam for South Hadley Falls Water Works", September 1891 by W.W. Stong, Civil Engineer, was obtained from the Town of South Hadley Water Department (see Appendix B). The reservoir was designed as part of the South Hadley Water Supply System.

2.2 CONSTRUCTION RECORDS

No construction records were located for this project. However, the above mentioned plan is in general conformity with the visual inspection of the structure except that the crest of the dam is 8 feet wide instead of the 12 foot width denoted on the plans. Also, the roadway and embankment of Route 202 were widened by approximately 9 feet and raised by approximately 7 feet as part of the 1927 reconstruction of the road. Periodic inspection reports by the Massachusetts Department of Public Works document the modifications to the outlet works previously mentioned in Section 1.2 of this report.

2.3 OPERATIONAL RECORDS

No formal operational records for Leaping Well Reservoir are maintained by the South Hadley Water Department.

2.4 EVALUATION

(a) Availability. Documents described above are available from the Town of South Hadley Water Department, District No. 1, 24 Bridge Street, South Hadley, Massachusetts 01075, and the Division of Waterways, State of Massachusetts. The design plan is also reported to be on file at the Hampshire County Commissioners Office - File #45 (see also Volume 13, Pages 208 and 209).

(b) Adequacy. The available data, in combination with the visual evaluation described in the following section, is adequate for the purpose of the Phase I Inspection.

(c) Validty. With the exception of the discrepancies noted in Section 2.2, the general observed configuration of the dam and appurtenances were in agreement with the construction plans.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

(a) General. Leaping Well Reservoir Dam is in fair condition at the present time as revealed by the field inspection of March 5, 1981. A copy of the inspection checklist is included in Appendix A. Leaping Well Reservoir Dam is an L-shaped earthfill dam having a crest length of approximately 480 feet. A circular gatehouse which consists of a brick foundation and wooden housing is situated approximately 30 feet south of the main embankment (see Photos No's. 1, 2 and 3). Flow through the 12 and 24 inch outlets is no longer controlled at the gatehouse as the valve operating mechanisms have been dismantled. The 12-inch pipe is used as the regulating outlet and is controlled by a gate valve in a manhole on the northwesterly side of Route 202 (see Photo No. 6). The 24-inch outlet acts as an overflow pipe and is uncontrolled.

(b) Dam. Leaping Well Reservoir Dam is an L-shaped earthfill embankment. The main leg of the dam (north embankment) runs east to west, parallel to Route 202, and is approximately 278 feet long. The northerly leg is 6 feet high at the east end and tapers to grade at the west end. Route 202 lies between the downstream discharge pipes and the main embankment. The highway embankment improves the stability of the north dam embankment. A second leg of the dam (east embankment) turns at an angle of 90° way from Route 202 and continues toward the south before blending into the current landscape. This portion of the embankment curves around the east edge of the reservoir, approximately 3 to 5 feet higher than abutting residential properties. The crest of the east embankment is 6 feet above the reservoir level. The upstream face of the east embankment, as well as the north embankment, is grassed without slope protection and is free of all but small brush and grass-type vegetation (see Photo No. 1). No sloughing was observed on either the north or east embankments. The east embankment gradually diminishes to the south, away from Route 202, blending into residential land previously filled to the elevation of the dam. Further south along the east boundary, a slight soil berm redevelops, approximately 1 to 3 feet higher than the filled land to the east. The dam along this stretch is heavily covered with small trees and roots, and consists of crudely mounded earth with no slope protection.

The westerly shore of the reservoir consists of higher ground, rising 10 to 20 feet above the reservoir water level. Nearer Route 202 the westerly side of the reservoir is bounded by filled land, approximately 5 to 6 feet above current water level. The filled land extends indefinitely to the west.

Along the downstream side of the crest of the north embankment is a chain-link fence (see Photo No. 2). There is no significant grass or brush growth along the downstream slope. Near the toe were found a row of stumps and fallen trees. Along the crest of the dam are healthy spruce trees, approximately 6 to 8 inches in diameter. Generally, the dam is heavily rooted with stumps and the existing trees (see Photo No. 11).

The downstream slope of the east embankment is characterized by large trees and exposed roots caused by erosion (see Photo No. 12). No evidence of seepage, past or present was observed anywhere along the dam.

(c) Appurtenant Structures

1) Principal Outlet. The principal outlet is a 12-inch gated pipe which is in good condition. As this pipe is gated on the downstream side only, it acts as a pressure conduit through the embankment. Should this pipe rupture anywhere between the gatehouse and the upstream side of the gate valve, uncontrollable pressure flow through the embankment would exist, thereby creating a potential for failure of the embankment. At the time of inspection it was observed that this pipe was discharging flow from the reservoir (see Photos No's. 7 and 8). The gate, which is located in a manhole on the north side of Route 202 (see Photo No. 6), is in good condition and well maintained.

   A 24-inch overflow from the gatehouse structure located within the impoundment pool outlets on the north side of Route 202 adjacent to the remains of a brick manhole (see Photos No's. 7 and 8). The outlet end of this overflow pipe has been reduced to a 12-inch diameter by a repair reportedly made in 1973 by personnel from the Town of South Hadley Water Department.

2) Gatehouse. This circular brick masonry structure is in poor condition at the present time. There is a considerable amount of ravelling of brick, and open

joints. Brick masonry up to 10 square feet has unravelled in the foundation of the structure (see Photos No's. 1, 2 and 3). There is evidence of past repairs to the brick masonry. According to a representative of the South Hadley Water Department, the four gates within this structure have not been operable for 20 years. Seepage is flowing through the brick masonry into the wet well from the surrounding reservoir. The wood framed roof of this structure is in fair condition.

The timber footbridge which spans the waterway between the spillway crest and the gatehouse is in poor condition (see Photo No. 1). This structure is severely distorted and is prone to excessive deflection and vibrations.

(d) Reservoir Area. There is some light to moderate commercial and residential development along Route 202 adjacent to the dam. There is also a residential area near the westerly shoreline of the reservoir. The remainder of the surrounding area is rolling wooded terrain.

(e) Downstream Channel. The 12-inch and 24-inch outlets pass under Route 202 and discharge into the natural channel of Leaping Well Brook. Leaping Well Brook flows in a northwesterly direction into Stony Brook which in turn flows into the Connecticut River.

3.2 EVALUATION

In general the dam and its appurtenant structures are in fair condition. The problem areas noted during the visual inspection are listed as follows:

(a) The nonfunctioning gates within the gatehouse, thereby eliminating upstream control of the outlets and creating a pressure conduit situation through the embankment.

(b) The deterioration of the brick masonry foundation of the gatehouse, which compromises the integrity of the structure.

(c) The poor condition of the pedestrian footbridge, which jeopardizes the safety of anyone who uses the structure.

(d) The heavy tree and root growth present along the upper embankment is considered deleterious due to the destructive action of roots upon the structural earthfill.

(e) The minor erosion of the downstream face of the east embankment, creating a potential for failure of the embankment if left uncorrected.

These deficiencies must be corrected to assure the continued performance of the dam. Measures to improve the condition of the dam are stated in Section 7 of this report.

SECTION 4
OPERATING AND MAINTENANCE PROCEDURES

4.1 OPERATING PROCEDURES

(a) General. The water level is checked in the reservoir every weekday. Generally, the valve for the 12-inch outlet is closed. However, when the level in the impoundment rises to El 211 (12 inches below the overflow pipe), the valve for the 12-inch outlet is opened until the water level drops to El 210 (24 inches below the overflow). The dam is not checked on weekends. No records of the operation of the dam are kept.

(b) Warning System. There is no established warning system or emergency preparedness plan in effect for this structure.

4.2 MAINTENANCE PROCEDURES

(a) General. The grass at the dam site is mowed on a regular basis. Otherwise, maintenance is performed on an informal basis only, with no formal maintenance program in effect. Repairs to the discharge end of the 24-inch outlet were performed as a result of comments from the State DPW (see Appendix B).

(b) Operating Facilities. The 12-inch outlet control valve which is housed in a manhole across Route 202 from the dam, is operated on a regular basis by the South Hadley Water Department to regulate the water level in the reservoir and is reported to be in good condition. Generally, the facilities are operated on an informal basis and operating procedure should be expanded and improved.

4.3 EVALUATION

There are no regular programs of maintenance or technical inspections at the dam. Present operational and maintenance procedures are inadequate. There is also no plan for warning the people downstream in the event of an emergency at the dam. Formal operational and maintenance procedures, technical inspection programs, warning system and emergency preparedness plans should be established. These programs should be implemented as recommended in Section 7.3.

SECTION 5
HYDRAULIC/HYDROLOGIC

5.1 GENERAL

Leaping Well Reservoir Dam is a 480 foot long earthfill dam with a 1 foot thick brick masonry waterstop 2 feet below the surface of the upstream slope. The watershed is 0.27 square miles of rolling terrain with about 30 percent of the drainage area being developed.

Leaping Well Reservoir is an impoundment of the headwaters of Leaping Well Brook. The outlet structure is a gatehouse located in the reservoir about 30 feet from the top of the upstream slope. Normal discharge from the reservoir is regulated through a 12-inch outlet line. A 24-inch iron pipe, which serves as a high water overflow outlet, flows from the gatehouse under Route 202 to Leaping Well Brook, its point of discharge. In 1973, the 24-inch outlet was reduced to a 12-inch diameter steel pipe when a repair was made to the collapsed discharge end of the pipe.

5.2 DESIGN DATA

Hydraulic and hydrologic computations are not available for the design of the outlet structure and appurtenances. A design plan for the dam was obtained from the Town of South Hadley Water Department.

5.3 EXPERIENCE DATA

There are no operational records kept for Leaping Well Reservoir. The only records of the past history of the dam are the original design plan of 1891 and inspection reports by the Massachusetts DPW.

5.4 TEST FLOOD ANALYSIS

Based on the Corps of Engineers' Guidelines, the recommended test flood range for the size (small) and hazard (high) is 1/2 Probable Maximum Flood to the full Probable Maximum Flood (PMF). With a sizable economic loss and a potential loss of more than a few lives, the Probable Maximum Flood was adopted as the test flood inflow. The watershed terrain consists of rolling hills with 1.8 percent of the total drainage area being upstream ponded water and marshland. For a drainage area of 2 square miles or less and rolling terrain, the Corps of Engineers' "Maximum Probable Flood Peak Flow Rates" guide curves indicate that, for the probable maximum flood unit peak inflow from the watershed is 2150 CSM. Applying this to the 0.27 square mile drainage area yields a peak flow of 580 cfs as the test flood inflow.

The top of the dam is at El 216.0. Analysis of the test flood routing indicates that a peak outflow of 470 cfs will occur at a stage of 216.3, resulting in an overtopping of the dam by 0.3 feet, assuming both outlets are open. Thus, the outlet works were judged to be inadequate as they can handle only 3% of the routed test flood outflow.

5.5 DAM FAILURE ANALYSIS

Based on the Corps of Engineers' Guidelines for estimating dam failure hydrographs, and assuming a breach width of 56 feet, which represents 40 percent of the mid-height length of 140 feet at a water surface elevation of 216 (top of dam), the dam failure outflow would be 14,400 cfs. This does not include the discharge from the outlets. There are two possible modes of failure which could occur at Leaping Well Dam. The first potential failure would include only that portion of the dam embankment above Route 202. The resultant failure outflow would severely damage Route 202 and cause flow depths of approximately 2 feet to 4 feet at as many as 7 homes and businesses that were not subject to any flow (from the dam) prior to failure, thereby creating the potential for severe economic loss and the possible loss of more than a few lives. The second possible failure mode would encompass the breaching of the total embankment, including Route 202. For the purposes of this report, failure of the total embankment was chosen for the calculation of the failure outflow and dam failure flood limits. As a result of this dam failure, a large portion of Route 202 would receive severe damage. Also, several nearby houses and small businesses would be subject to flooding and damage to homes, businesses, and property would occur downstream. It is estimated from the USGS sheets downstream of the dam that no damage to structures would occur at prefailure depths, however, 5 buildings would experience flow depths from 5 to 10 feet following dam failure. In addition, Route 116 would be overtopped by approximately 5 feet. Consequently, with the potential loss of more than a few lives and the severe economic losses associated with the damage to Routes 116 and 202 and the adjacent buildings, the dam is classified as "high" hazard potential.

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1. VISUAL OBSERVATIONS

Leaping Well Reservoir Dam is in fair condition at the present time as revealed by the field inspection of March 5, 1981. There has been no significant displacement or distress which would warrant structural stability calculations. Considerable ravelling of brick was observed in the masonry foundation of the gatehouse. Deterioration of the timber footbridge was also observed. The other items of concern are the heavy tree and root growth present in both the north and east embankment, minor erosion of the downstream face of the east embankment, and the 12-inch pressure conduit through the embankment which could potentially cause a failure of the embankment.

6.2 DESIGN AND CONSTRUCTION DATA

The dam was designed in 1891 and presumably constructed in the 1890's. A copy of the original design plan and a section through the north embankment are on record at the South Hadley Water Department. Until the mid-1950's the reservoir was used for South Hadley's water supply. No records of structural stability analysis are available for this dam.

6.3 POST-CONSTRUCTION CHANGES

There are no records of the post construction changes to the outlet controls. However, the valve control mechanisms in the gatehouse have been dismantled and are no longer functioning. The valves are reportedly in the open position. Also, the 12-inch outlet pipe is controlled by a regulatory valve housed in a manhole across the road from the dam. In addition, as part of the 1927 road reconstruction, the roadway surface and embankment of Route 202 in the vicinity of the dam were widened by approximately 9 feet, and raised by approximately 7 feet.

6.4 SEISMIC STABILITY

The dam is located is Seismic Zone No. 2 and, in accordance with recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

(a) Condition. The Leaping Well Reservoir Dam is in FAIR condition at the present time. The deteriorated brick masonry foundation of the gatehouse and the deteriorated timber footbridge should be repaired. Upstream control should be provided for the 12-inch pressure conduit through the embankment. There are trees and stumps on both legs of the dam which should be removed and some areas of minor erosion on the downstream face of the east dike which will require some attention.

(b) Adequacy of Information. Available engineering data is limited to an original plan and cross-section of the dam, which contain very little detailed information and, therefore, adequacy of this dam is based primarily on visual inspection, past performance history, and sound engineering judgment.

(c) Urgency. The recommendations and remedial measures enumerated below should be implemented by the owner within one year of receipt of this Phase I Inspection Report with the exception of formulation of an Emergency Action Plan which should be commenced immediately.

7.2 RECOMMENDATIONS

It is recommended that the Owner retain the services of a qualified Registered Professional Engineer to:

(a) Investigate the condition of the brick masonry foundation and prepare plans for its restoration.

(b) Prepare plans for providing upstream control on 12-inch outlet.

(c) Prepare plans for strengthening or replacement of the footbridge.

(d) Investigate the size, number, type, discharge locations, and operational capabilities of the existing outlets.

(e) Perform a detailed hydrologic/hydraulic investigation to assess further the potential of overtopping the dam and the need for and the means to increase project discharge capacity.

(f) Draw specifications for and supervise the removal of all trees, stumps and roots from the north and east legs of the embankment and within 15 feet of the downstream toe and replacement of any voids thereby created with engineered fill.

(g) Design slope protection for the upstream face of the north and east embankments,

(h) Prepare plans for providing topsoil and seed and the establishment of protective grass cover on unprotected areas of the downstream slope of the north and east embankments.

The Owner should implement the recommendations of the above engineering studies.

7.3 REMEDIAL MEASURES

(a) Operation and Maintenance Procedures

(1) Establish a formal operational procedure and maintenance program. The operational procedure should include provisions for opening the outlet control valve in anticipation of high rainfall or high discharges.

(2) Institute a program of annual technical inspections by a qualified Registered Professional Engineer.

(3) Develop an "emergency action plan" that will include an effective preplanned warning system, locations of emergency equipment, materials and manpower, authorities to contact, and potential areas that may require evacuation. The plan should also include around the clock monitoring of the project during periods of heavy precipitation. This plan should be developed immediately upon receipt of this Phase I Investigation Report.

7.4 ALTERNATIVES

There are no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLISTS

INSPECTION TEAM ORGANIZATION

Date: March 5, 1981

Project: MA 00586
Leaping Well Reservoir
South Hadley, Massachusetts

Weather: Clear, cold

INSPECTION TEAM

Kenneth W. Hodgson, Jr.	Cullinan Engineering Co., Inc. (CEC)	Team Captain
Gregory M. Valiton	CEC	Hydraulics
William S. Zoino	Goldberg, Zoino & Associates (GZ)	Soils
Steve Trettel	GZ	Soils
Andrew Christo	Andrew Christo Engineers, Inc (ACE)	Structures
Paul Razgha	ACE	Structures
Carl Razgha	ACE	Structures

Owner was not represented at inspection

NOTE: Observed water surface elevation in reservoir at time of inspection = El 210.0±

LEAPING WELL RESERVOIR
MA 00586

March 5, 1981

CHECKLISTS FOR VISUAL INSPECTION

AREA EVALUATED	BY	CONDITION & REMARKS
UPSTREAM SLOPE		
Vegetation	GZ	Grass, roots
Sloughing or Erosion		None
Rock Slope Protection - Riprap Failures		None
Animal Burrows		None
CREST		
Vegetation		Grass growth, 6" - 12" trees
Sloughing or Erosion		None
Surface Cracks		None
Movement or Settlement		None
DOWNSTREAM SLOPE		
Vegetation		Tree stumps, grass
Sloughing or Erosion		None
Surface Cracks		None
Animal Burrows		None
Movement or Cracking Near Toe		None
Unusual Embankment or Downstream Seepage		None, water level below embankment level at time of inspection
Piping or Boils		None
Foundation Drainage Features		None
Toe Drains	GZ	None

LEAPING WELL RESERVOIR
MA 00586

March 5, 1981

CHECKLISTS FOR VISUAL INSPECTION

AREA EVALUATED	BY	CONDITION & REMARKS
GENERAL		
Lateral Movement	GZ	None
Vertical Alignment		Good
Horizontal Alignment		Good
Condition at Abutments and at Structures		Stable
Indications of Movement of Structural Items		None - deterioration of foundation brick, control house
Trespassing		Fence cut, bent
Instrumentation Systems	GZ	None
OUTLETS		
12-Inch Gate Valve	ACE	Good operating condition
Gate Manhole		Good condition
12-Inch C.I. Pipe (Inlet to Wet Well)		Good condition
GATE HOUSE		
Brick Foundation		Extensive unravelling of brick. Up to 10 square feet at one location. Numerous open joints.
Wood Framed House and Roof		Good condition
Timber Footbridge	ACE	Excessive deflection and vibration

APPENDIX B

ENGINEERING DATA

The Commonwealth of Massachusetts

Executive Office of Transportation and Construction

Department of Public Works

DISTRICT #2 OFFICE
NORTH KING STREET, NORTHAMPTON 01060

November 18, 1977

DEPARTMENT OF
ENVIRONMENTAL QUALITY ENGINEERING
DIVISION OF WATERWAYS

RECEIVED NOV 22 1977

Referred To AM
Report back to
File

SUBJECT: Dam - South Hadley
Leaping Well Reservoir
Dam No. 2-8-275-7

Mr. Robert T. Tierney, P.E.
Chief Engineer
Mass. Dept. Public Works
100 Nashua Street
Boston, Massachusetts 02114

ATTENTION: Mr. John J. Hannon, Chief
Engineer of Waterways Division

Dear Sir:

Enclosed is a Dam Reinspection Report for the Leaping Well Reservoir Dam No. 2-8-275-7, in South Hadley.

Very truly yours,

FRANCIS J. HOEY, P.E.
District Highway Engineer

FJH/fc
2-HTB
Encl.

INSPECTION REPORT - DAMS AND RESERVOIRS

(1.) LOCATION:

City/Town South Hadley. County Hampshire. Dam No. 2-3-275-7.

Name of Dam Leaping Well Reservoir Dam.

Topo Sheet No. 12E. Coordinates: (Mass. Rect.) N 451,200; E 311,700.

Inspected by: Harold T. Shumway, On Nov. 15, 1977. Date Last Inspection 1/28/76.

(2.) OWNER/S: As of Nov. 15, 1977

per: Assessors ____, Reg. of Deeds ____, Prev. Insp. X, Per. Contact X.

	Name	St. & No.	City/Town	State	Tel. No.
1.	South Hadley Fire District #1 Water Dept.,	39 Lamb St.,	So. Hadley,	Mass.	
2.					
3.					

(3.) CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.
Mr. Robert Moos, Supt. Water Dept.,	39 Lamb St.,	South Hadley,	Mass.	

(4.) DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where At Hampshire County Commissioners Office, File #45 - See also Vol. 13, Pages 208 and 209 - Plan filed Sept. 1, 1891

(5.) DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor ____.
2. Moderate X.
3. Severe ____.
4. Disastrous ____.

Comments: Approx. 28 million gallons impoundment - deep ravine downstream would appear capable of containing released waters - minor development downstream.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: In gatehouse - 24" diameter C. I. pipe.

Controls Yes, TYPE: Gate valves.

Automatic____. Manual X. Operative Yes____, No X.

Comments: Gate valves wide open - controls disconnected. Pipe serves as an overflow spillway.

No. 2 Location and Type: From side of former pumphouse-12" diam. asbestos pipe.

Controls Yes, Type: Gate valves.

Automatic____. Manual X. Operative Yes X, No____.

Comments: This pipe is connected to a 12" diam. intake feed pipe from gate house to site of old pumphouse. Pipe controls level of pond.

No. 3 Location and Type:____.

Controls____, Type:____.

Automatic____. Manual____. Operative Yes____, No____.

Comments:____.

Drawdown present Yes X, No____. Operative Yes X, No____.
Comments: See Nos. 1 and 2 above.

(7.) DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 20'±.

Material: Turf X. Brush & Trees X. Rock fill____. Masonry____. Wood____.

Other 6" to 12" diam. firs on top edge of slope next to roadway.

Condition: 1. Good X. 3. Major Repairs____.

2. Minor Repairs____. 4. Urgent Repairs____.

Comments: Embankment mowed - fir trees do not appear to create a hazard to safety of dam.

(8.) DAM DOWNSTREAM FACE: Slope 1:1 to highway, 2:1 from highway.

Material: Turf X. Brush & Trees____. Rock Fill____. Masonry____. Wood____.

Other 2± feet trap rock paving on lower portion of slope.

Condition: 1. Good X. 3. Major Repairs____.

2. Minor Repairs____. 4. Urgent Repairs____.

Comments: Minor erosion along toe of slope and brook banks - bit. conc. apron has been spread over slope above 12" diam. asbestos pipe.

9. EMERGENCY SPILLWAY: Available No. Needed No.

Height Above Normal Water_____Ft.

Width_____Ft. Height_____Ft. Material_____.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments:_____

_____.

10. WATER LEVEL AT TIME OF INSPECTION: 5 Ft. Above_____. Below X.

Top Dam_____X_____ F.L. Principal Spillway_____.

Other_____.

Normal Freeboard_____4_____Ft.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Minor growth of brush in crevices of gate-house walls. Row of fir trees on top edge of upstream slope.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam None found.

Cracked or Damaged Masonry Cracks noted in brick walls of overflow well beneath gatehouse

Evidence of Seepage Minor seepage at toe of slope.

Evidence of Piping None found.

Leaks None found.

Erosion Minor erosion of brook banks at toe of slope.

Trash and/or Debris Impeding Flow None found.

Clogged or Blocked Spillway None found.

Other_____.

12. OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed__y_____.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

---

13. REMARKS AND RECOMMENDATIONS: (Fully Explain)

Mr. George McDonnell, P.E., a consultant to the South Hadley Fire District #1, was present during this inspection. Per Mr. McDonnell, the 12" diam. C.I. pipe attached to what was assumed to be a 2-" diam. pipe from the gatehouse, is now merely a high water overflow pipe. All controls at the gatehouse wet well on this pipe have been dismantled, with the gate valve in fully open position. The main control on the water level of the reservoir is the 12" diam. asbestos pipe and gate valves. On day of inspection the asbestos pipe was discharging half pipe. A bituminous concrete apron has been installed on the slope above the asbestos pipe and extends down to and around the outlet end of the pipe.

Cracks noted in the brick walls of the overflow well beneath the gatehouse have existed for many years, per Mr. McDonnell, and do not pose any hazard to safety of dam. This reservoir is now completely separated from the water system and plans are being discussed to lower the reservoir level and install an overflow type C.I. and conduit in future years per Mr. McDonnell. This dam appears to be stable and safe at present time with only routine minor maintenance repairs needed.

HTI fc

C-HTI

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

October 19, 1976

Robert Moos, Superintendent
Water Department
39 Lamb Street
South Hadley, Massachusetts

RE: Inspection Dam #2-8-275-7
South Hadley
Leaping Well Reservoir Dam

Dear Sir:

On January 28, 1976 , an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be So. Hadley Fire District #1. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams-Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however the following conditions were noted that require attention:

Erosion on brook banks at toe of dam slope should be corrected.

A close check should be maintained on seepage conditions noted around the 12" diameter asbestos pipe outlet.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

JOHN J. HANNON, P.E.
CHIEF ENGINEER

A.J.C:ajl

WATER DEPARTMENT - FIRE DISTRICT NO. 1

39 LAMB STREET

SOUTH HADLEY FALLS, MASS.

November 27, 1974

Commonwealth of Massachusetts
Department of Public Works
Division of Waterways
100 Nashua Street
Boston, Massachusetts 02114

Attention: Mr. Malcolm E. Graf,
Associate Commissioner

Re: Leaping Well Reservoir Dam
Dam #2-8-275-7

Gentlemen:

Reference is made to your letter of November 16, 1973 pointing out the need for certain maintenance and repair work at the above-subject dam.

A portion of the work has been accomplished to date and during the past few months we have been in contact with the Highway Division regarding information provided our Department by a retired employee who has stated that the end of the pipeline through the dam embankment was extended by Highway Division personnel many years ago. The District Highway Engineer, Mr. Hoey, has had an investigation made to determine if there is any record of the extension or alteration of the pipeline through the dam by State Highway personnel. In a communication dated November 15, 1974 Chief Engineer Tierney of the Massachusetts Department of Public Works has notified our Board of Water Commissioners that the Mass. DPW has in no way contributed to the present condition of the overflow pipe at the dam and, therefore, disclaim all liability for repair to same.

While investigating the possibility of State involvement we did take bids on the repair of the pipeline. However, because of the season of the year and the wet conditions at the site, we have been advised by our consulting engineer to defer the initiation of work on the pipeline at the embankment toe until next summer.

We have complied with a portion of your recommendations in that the end of the 24" pipe has been exposed and water overflow from the spillway passes through the pipe without backing up.

Some of the vegetation at the toe of the embankment has been removed.

The presence of a cavity in the toe of the embankment just behind the end wall indicates that there is a break in the overflow pipe in that general location. We plan to draw down water in storage in the reservoir this coming summer and then close the drawdown gate to store water and prevent discharge through the overflow pipe. We will excavate the cavity, locate the damaged portion of the pipeline and then determine the repair method to be used. It is possible that our investigation will show only a minor length of the pipeline needs to be replaced.

In the meantime, should the cavity become larger we will control the situation by depositing broken stone or gravel into the cavity. Since the location is nearly directly across the street from our storage and operations facilities, we can monitor conditions at the dam conveniently.

It is respectfully requested that our plan and our schedule as set forth hereinbefore be accepted and approved by your Division.

Very truly yours,

Robert E. Moos

Robert E. Moos, Supt.
Water Department

REM/mm

#17930
DAM# 2-8-275-7

November 18, 1974

Sidney A. Crossland, Chairman
Board of Water Commissioners
39 Lamb Street
South Hadley Falls, Mass.

Dear Sir:

Your letter, dated September 24, 1974, to Malcolm R. Graf, Associate Commissioner of Waterways for the Massachusetts Department of Public Works, relative to repairs to an overflow drainage pipe at the location of the Leaping Well Reservoir Dam, South Hadley, has been referred to the Department's Maintenance Division for investigation.

Copies of your letter and other correspondence relating to the same matter were made available to Mr. F. J. Hoey, District Highway Engineer at Northampton, in whose district the subject dam is located. It was requested that Mr. Hoey conduct an investigation to ascertain what responsibility, if any, the Department might have regarding the proposed repair work on the overflow drain, as mentioned in your letter.

A letter from the District Highway Engineer, outlining the results of the investigation, has been received. A copy of this report is enclosed.

Having reviewed Mr. Hoey's report and other available information relative to subject matter, it is my opinion that the Massachusetts Department of Public Works has in no way contributed to the present condition of the overflow pipe at the dam and, therefore, disclaims all liability for repairs to same.

Very truly yours,

ROBERT T. THERRIEN, P.E.
CHIEF ENGINEER

BBS/he
CC: TGB
MEG
FJH
Encl.

The Commonwealth of Massachusetts
Executive Office of Transportation and Construction
Department of Public Works
DISTRICT 2 OFFICE
NORTH KING STREET, NORTHAMPTON 01060

October 29, 1974

SUBJECT: M-South Hadley
Leaping Well Reservoir Dam

Mr. Robert T. Tierney, P.E.
Chief Engineer
Mass. Dept. Public Works
100 Nashua Street
Boston, Massachusetts 02114

ATTENTION: Mr. Sherman Eidelman
Deputy Chief Engineer for Maintenance

Dear Sir:

The matter of the Leaping Well Reservoir Dam has been referred to the Maintenance Section in this office for further investigation.

We have reviewed all of the correspondence that has been made available to us by the Waterways Division, the District Dam Engineer, Mr. George McDonnell of Tighe & Bond, and the Water Department Fire District No. 1 of South Hadley. The District Maintenance Engineer has made a field inspection and had a new cross section and detail taken at the location in question.

It is the contention of the Fire District and Mr. McDonnell, the Town's Consultant, that at some time in the past (Mr. McDonnell says the 1920's) the Department extended the existing 24 inch cast iron pipe with a 24 inch corrugated metal pipe either to support the roadway embankment or because we had surplus excavation to be wasted. Both of these statements have been made.

We can find no record of any agreement or easement concerning this matter in the District files and the Town can produce none either. They allege that this work was done in accordance with a verbal agreement between the unknown parties involved.

The sole support for the Town's argument is the recollection of a retired employee. Some time in the 1920's is apparently as accurately as this event can be dated.

As stated in the reports submitted by the Dam Engineer, the 1927 construction plans show the 24" cast iron outlet located some 65 feet from the highway baseline. There is no indication that the then existing stone header was in any

October 29, 1974

SUBJECT: M-South Hadley
Leaping Well Reservoir Dam

Mr. Robert T. Tierney, P.E.

Page Two

way disturbed nor the slope affected by the highway construction. There is no indication at present of the stone header shown on the 1927 plans.

Our records do reveal that in 1953 a Permit, #P-7672, was issued to the Town of South Hadley to install a drainage system within the State Highway Layout. This Permit was issued as a result of negotiations between the Town and this Department. Originally, a private contractor asked to connect the drainage from his development to the Department's storm drainage system. Sufficient capacity was not available to allow this connection. The developer would have been required to construct a new system within the highway layout. At the request of the Town, the Department issued a Permit to the Town to install three manholes and some 550 feet of pipe within the layout. The planned outfall for this system was in the brook at the dam overflow header. The Department's only interest in this system was for that portion within the layout. The construction outside the layout was the concern and responsibility of the Town. The headwall to be constructed at the outfall in the brook was never constructed as shown on the plans submitted in 1953. This was not, and still is not, of concern to this Department. The 24 inch corrugated pipe referred to by the Town was not seen by any Department personnel that investigated this matter.

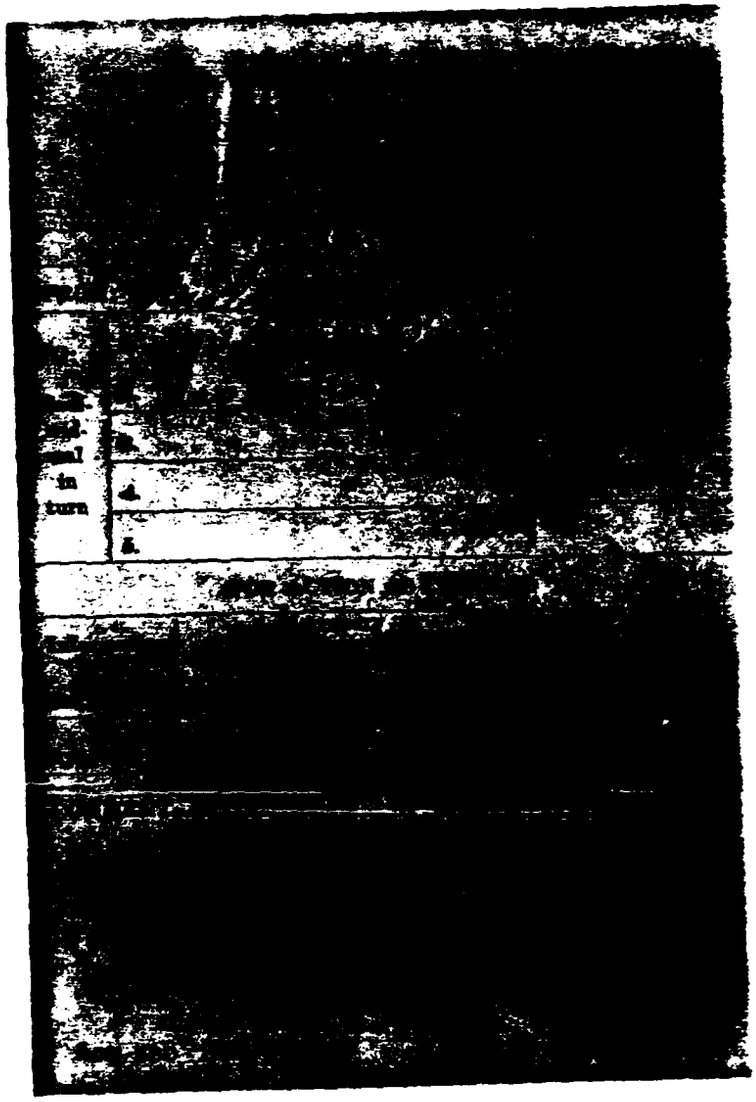
From our review of the available information, it is our opinion that this Department is in no way responsible for the condition of the overflow drain from the reservoir.

From the cross section taken during our investigation, it appears that the outlet pipe length might be cut back 9 feet by the Town and still maintain a 2:1 slope on the embankment.

Very truly yours,

FRANCIS J. [illegible], P.E.
District Highway Engineer

AWC/fm
C-MEG
JFK
AWC



INSPECTION REPORT - DAMS AT RESERVOIRS

(1.) LOCATION:

City/Town South Hadley. County Hampshire. Dam No. 2-8-275-7.

Name of Dam Leaping Well Reservoir Dam.

Topo Sheet No. 12 B. Coordinates: Mass. Rect. N 451,200, E 311,700.

Inspected by: Harold T. Shumway, On Jan. 28, 1976. Date Last Inspection 10/24/73

(2.) OWNER/S: As of January 28, 1976

per: Assessors____, Reg. of Deeds____, Prev. Insp. X, Per. Contact____.

1. South Hadley Fire District No. 1
Water Dept., 39 Lamb Street, South Hadley, Mass.
Name | St. & No. | City/Town | State | Tel. No.

2. ____
Name | St. & No. | City/Town | State | Tel. No.

3. ____
Name | St. & No. | City/Town | State | Tel. No.

(3.) CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Robert Moos,
Supt. Water Dept., 39 Lamb St., South Hadley, Mass.
Name | St. & No. | City/Town | State | Tel. No.

(4.) DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where At Hampshire County Commissioners Office - File #45 - See also Vol. 13, Pages 208 and 209 - Plan filed Sept. 1, 1891.

(5.) DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor____.
2. Moderate X.
3. Severe____.
4. Disastrous____.

Comments: Leaping Well brook runs thru a deep ravine with a wide bottom sufficient to carry the expected flood. Damage would be confined to areas where roads cross the ravine or where development is occurring on ravine floor.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: In Gate House - 24" dia. C.I. pipe.

Controls yes, TYPE: Gate valves.

Automatic ____. Manual X. Operative Yes ____, No Unk.

Comments: See remarks and recommendations.

No. 2 Location and Type: From site of former pumphouse - 12" dia. asbestos pipe.

Controls yes, Type: Gate valves.

Automatic ____. Manual X. Operative Yes X, No ____.

Comments: This pipe is connected to a 12" intake feed pipe from gate house to former pumphouse and will serve as a drawdown pipe when necessary.

No. 3 Location and Type: ____

Controls ____, Type: ____

Automatic ____. Manual ____. Operative Yes ____, No ____.

Comments: ____

Drawdown present Yes X, No ____. Operative Yes ____, No ____.
Comments: See No. 1 above and No. 2.

(7.) DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 20'±

Material: Turf X. ~~Brush~~ Trees X. Rock fill ____. Masonry ____. Wood ____.

Other 6" to 12" dia. fir trees on top edge slope next to hwy.

Condition: 1. Good X. 3. Major Repairs ____.

2. Minor Repairs ____. 4. Urgent Repairs ____.

Comments: Embankment well mowed - no brush growth evident - Fir trees do not appear to create any hazard at present time.

(8.) DAM DOWNSTREAM FACE: Slope 1:1 to highway 2:1 from highway.

Material: Turf X. Brush & Trees X. Rock Fill ____. Masonry ____. Wood ____.

Other 2½ inch trap rock paving on lower portion of slope.

Condition: 1. Good ____. 3. Major Repairs ____.

2. Minor Repairs X. 4. Urgent Repairs ____.

Comments: Seepage and erosion of toe of embankment noted.

(9.) EMERGENCY SPILLWAY: Available No Needed No

Height Above Normal Water_____Ft.

Width_____Ft. Height_____Ft. Material_____

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments:_____

(10.) WATER LEVEL AT TIME OF INSPECTION: 4 Ft. Above_____ Below X.

Top Dam X F.B. Principal Spillway_____.

Other_____.

Normal Freeboard 4 Ft.

(12.) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Row of fir trees on top edge of upstream slope.

Animal Burrows and Washouts None found

Damage to Slopes or Top of Dam None found

Blocked or Damaged Masonry Brick manhole has been partially demolished.

Evidence of Seepage Seepage noted around outlet end of 12" dia. asbestos pipe coming from location of former pumphouse.

Evidence of Piping None found

Leaks None found

Erosion yes - Embankment erosion taking place at toe downstream slope.

Trash and/or Debris Impeding Flow yes - 12" C.I. pipe blocked by large stone.

Clogged or Blocked Spillway_____

Other_____

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

Conditions of upstream slope and structures appear the same as on last inspection of Oct. 24, 1973. Top of dam embankment was well mowed and no brush was evident. On the downstream slope several changes were noted. The old pumphouse has been removed. An asbestos pipe, 12" diameter, was noted emerging from location of former pumphouse. Some seepage flow was noted around outlet end of this pipe. Directly on top of concrete block where several flows of water were noted in last inspection there is now a 12" dia. C.I. pipe. This pipe is just westerly of old brick manhole and was flowing full pipe. However, a large rock has been placed in the pipe which is retarding the flow of water. The brick manhole has been partly dismantled and what appears to be a new 12" dia. pipe has been installed through the back wall of manhole. This pipe also had a considerable flow of water in it. The entire embankment slope around and above brick manhole has been paved with 2½" traprock.

The 12" diameter C.I. pipe is in the approx. location where 1891 plans showed a 24" outlet pipe from gate house. There was no evidence of the existence of a 24" pipe anywhere in the area.

On Feb. 4, 1976, Mr. Robert Moos, Supt. of South Hadley Water Dept., called our District #2 office and the following information was given by him:

1. The 12" diameter pipe noted in remains of brick manhole is a highway storm drain,
2. The 12" diameter asbestos pipe is connected to a 12" pipe feeding from gate house to former pumphouse;
3. The 12" diameter C.I. pipe is connected to old 24" diameter C.I. pipe and serves as main overflow conduit for reservoir. Mr. Moos stated that this arrangement of drains was designed and installation of same supervised by Mr. George McDonnell, P.E. and a retired Chief Engineer for Tighe and Bond Div. of SCI.

A phone call to Mr. McDonnell, who is now retired from Tighe & Bond, verified most of Mr. Moos' statements and gave this additional information.

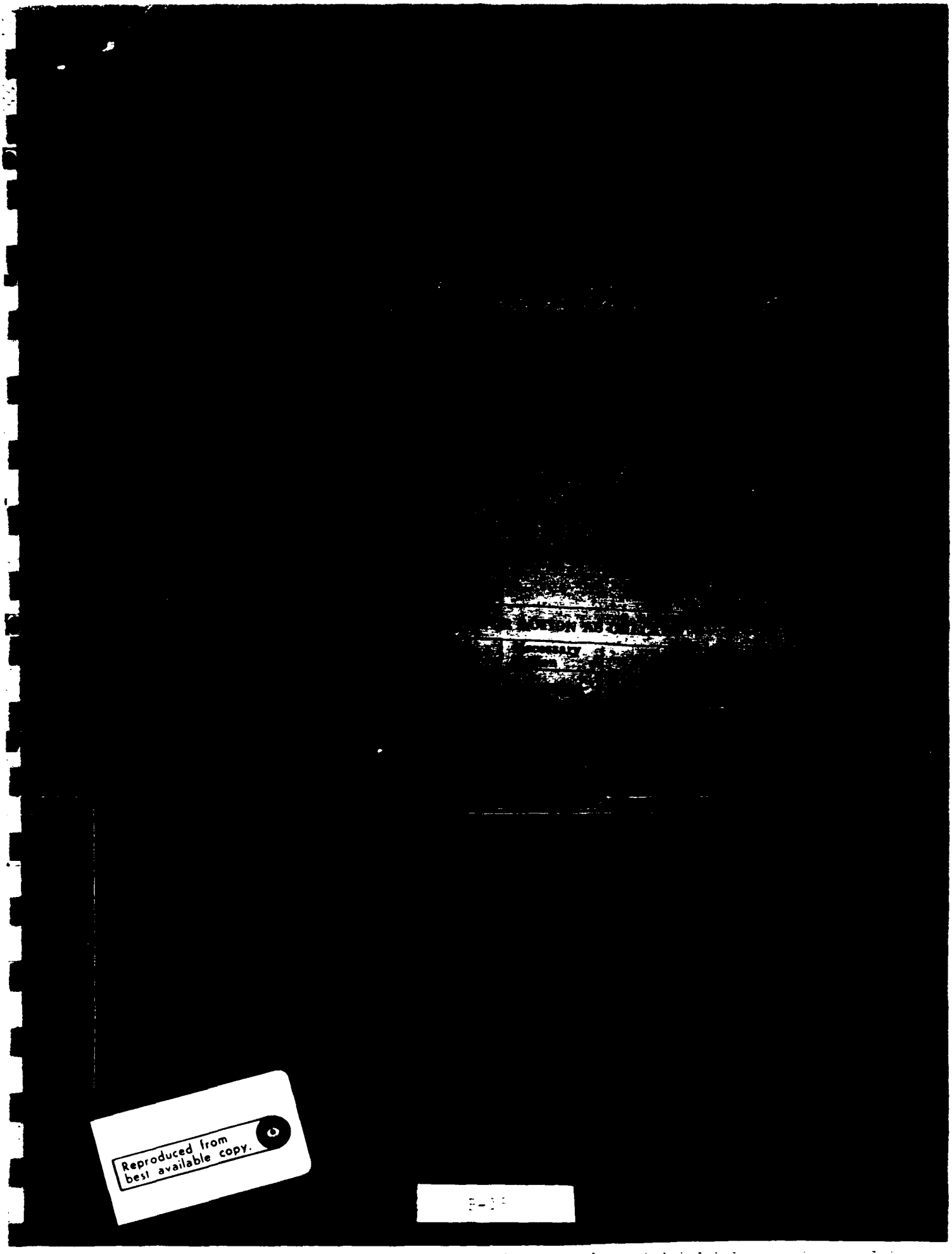
Mr. McDonnell stated that excavation at toe of slope where outlet of 24" C.I. pipe was supposed to be produced remains of an old C.I. pipe rusted and crushed. Excavation was made back along this pipe for a distance of 18' to 20' towards gate house to a point where the pipe was whole and sound. At this point the old pipe, which Mr. McDonnell stated appeared to be less than a 24" diameter

size, was cut and a 12" well casing was wedged into the old pipe. The joint was packed with sealing compounds and the entire joint sealed on the outside with a concrete collar. The well casing pipe was extended to the top of the old concrete headwall which originally held the larger conduit. The excavation was refilled with the 2½" trap rock which was noted previously in this report. Mr. McDonnell stated that while this work was being done the reservoir was drawn down by the 12" asbestos pipe. He stated that this asbestoe pipe was operating during the exceptionally heavy rains of last Sept. 1975, and continued to lower the reservoir level even during this severe storm. Mr. McDonnell therefore feels that the newly installed 12" diameter well casing pipe plus the 12" dia. asbestos drain pipe are more than sufficient to handle any overflow from the reservoir without endangering the embankment. Mr. McDonnell also stated that the 12" diameter storm drain outlet in old brick manhole was the outlet for a storm drain system which originates in the drainage area upstream of the Leaping Well Reservoir. This system removes some runoff volume which otherwise would add to a storm buildup in the reservoir.

Based on the information from Mr. George McDonnell and the visual field inspection of Jan. 28, 1976, it appears that most of the repairs have been made which were indicated as necessary at last inspection of Oct. 24, 1973.

The District recommends that owners be requested to maintain a close check on seepage conditions noted around 12" diameter asbestos pipe outlet and that corrective steps be taken by owners to stop erosion occurring on brook banks at toe of slope of dam.

HTS/bk



WATER DEPARTMENT - FIRE DISTRICT NO. 1

39 LAMB STREET

SOUTH HADLEY FALLS, MASS.

May 15, 1974

Dept. Of Public Works
DIVISION OF WATERWAYS
ASSOCIATE COMMISSIONER

Commonwealth of Massachusetts
Department of Public Works
Office of the Commissioner
100 Nashua Street
Boston, Massachusetts 02114

Attention: Mr. Malcolm E. Graf,
Associate Commissioner

Gentlemen:

Re: Inspection-Dam
#2-8-275-7
South Hadley
Leaping Well Reservoir Dam

This will acknowledge receipt of your communication regarding conditions noted at the above-subject dam at the time of your inspection last fall.

We have instructed our Consulting Engineer, George H. McDonnell of Tighe & Bond, to investigate conditions at the toe of the dam and to submit recommendations with related cost estimates to the undersigned and the Board of Water Commissioners.

A copy of the letter from Mr. McDonnell relative to this matter is attached hereto for your file and information.

As soon as we receive the recommendations from the engineer and arrive at a schedule for financing and accomplishing necessary repair work we will notify you of action planned by the Water Department.

Very truly yours,

Robert E Moe

Robert E. Moe, Superintendent

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS

RECEIVED MAY 20 1974

J. Piasecny

REM/mm

Enclosure

cc: Francis J. Hoey

GEORGE F. MCDONNELL
PHILIP W. SHERIDAN
EDWARD J. BARON

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INDUSTRIAL WASTES - SOLID WASTES
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

TIGHE & BOND
CONSULTING ENGINEERS
ENVIRONMENTAL SPECIALISTS

ASSOCIATES
MICHAEL R. FINN
GERARD D'HEUREUX
EDWARD A. MOE
DENNIS A. TRIPP

LABORATORY DIRECTOR
GARY R. SWANSON

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS 01040
TEL. 413-533-3991

S-314-00
May 15, 1974

Mr. Robert E. Moos, Supt.
Water Department
Fire District #1
Bridge and Lamb Streets
South Hadley, Massachusetts 01075

Dear Sir:

Re: Leaping Well Reservoir Dam

Reference is made to the communication from Malcolm E. Graf, Associate Commissioner of the Department of Public Works, Commonwealth of Massachusetts relative to conditions noted at the above-subject reservoir dam at the time of an inspection made on October 24, 1973.

The comments in the communication from Associate Commissioner Graf indicate that the outlet pipe through the dam is not visible and apparently is covered by fill from slope widening. Also, the letter referred to uprooted trees.

At your request I made an inspection of the dam, particularly its toe area and downstream embankment slope. As a result of this inspection I verbally recommended that the brook downstream of the dam be profiled for a distance of about 100', the end of the outlet pipe be uncovered and the cause of soil settlement at the embankment toe be investigated to determine if a broken pipe exists under the settled area.

On the day of inspection we both observed an up-flow of water in the bed of the brook at the point where the outlet pipe may be located. Thus, it is possible that silting of the brook has caused the end of the pipe to be covered.

As per our verbal instructions we will make the necessary field investigation and will prepare a letter of recommendation and cost estimate of the needed work at the toe area and on the downstream slope of the embankment surface.

Our investigation will begin as soon as field personnel can be assigned to the work. This will probably be prior to the end of this month.

Very truly yours,

TIGHE & BOND

George H. McDonnell
Chief Engineer

GHM/mm

November 16, 1973

Robert Moss, Superintendent
Water Department
South Hadley Fire District No. 1
36 Lamb Street
South Hadley Falls, Massachusetts 01075

RE: Inspection-Dam
#2-8-275-7
South Hadley
Leaping Wall Reservoir Dam

Dear Mr. Moss:

On October 24, 1973 an engineer from the Massachusetts Department of Public Works inspected the above dam which is owned by the South Hadley Fire District No. 1.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicate that repairs are needed. The following conditions were noted that require attention:

1. The outlet of the 24 inch cast iron pipe could not be located. It appears that it is covered by fill from widening the slope. Streams of water were noted flowing out of the slope in the vicinity. It is strongly recommended that the pipe outlet be uncovered and extended, and the slope re-graded and protected to prevent the reoccurance of this hazardous condition.

Robert Moss, Supt. -2- November 16, 1973
39 Lamb Street
Dam #2-8-275-7

2. Remove the uprooted trees from the embankment and backfill with suitable material, properly compacted and graded.

We call these conditions to your attention now and expect your prompt action in these matters.

Very truly yours,

MALCOLM E. GRAF
Associate Commissioner

LR:rvlc
cc. F. J. Hoey
R. Salls

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

~~City~~/Town South Hadley. County Hampshire. Dam No. 2-8-275-7.

Name of Dam Leaping Well Reservoir Dam.

Topo Sheet No. 12B. Coordinates: Mass. Rect. N 451,200, E 311,700.

Inspected by: R. C. Salls, P.E., On Oct. 24, 1973. Date Last Inspection Oct. 1969.

---

2. OWNER/S: As of November 1972

per: Assessors X, Reg. of Deeds ____, Prev. Insp. ____, Per. Contact X.

	Name	St. & No.	City/Town	State	Tel. No.
1.	South Hadley Fire District No. 1 Water Department	39 Lamb Street	South Hadley Falls	Mass.	01075
2.					
3.					

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.
Supt. Water Department Robert Moos	39 Lamb Street	South Hadley Falls	Mass.	01075

---

4. DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where At Hampshire County Commissioners Office - File # 45- See also Vol. 13, Pages 208 and 209 - Plan filed September 1, 1891.

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5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor ____. 3. Severe ____.

2. Moderate X. 4. Disastrous ____.

Comments: Leaping Well Brook runs through a rather deep ravine with its bottom sufficiently wide to carry the expected flood. Damage would be restricted to a few locations where roads cross the ravine or where development is encroaching on to ravine floor.

*This rating may change as land use changes (future development).

(6.) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: From gate house well - 24" C.I. pipe.

Controls Yes, TYPE: Gate valves.

Automatic____. Manual X. Operative Yes____, No____. Unknown

Comments: 4" gate open into bottom of gate well and 24" outlet pipe gate open - outlet end pipe at Rte. 202 1927 Reconst. BL Sta. 36-79 - Rt. 85'.

No. 2 Location and Type: Water intake pipe from gate house to pump house unused.

Controls_____, Type:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments: Pump house scheduled for removal.

No. 3 Location and Type:_____.

Controls_____, Type:_____.

Automatic_____. Manual_____. Operative Yes_____, No_____.

Comments:_____.

Drawdown present Yes X, No____. Operative Yes____, No____.

Comments: Outlet not found. Water running from lower portion of downstream slope.

(7.) DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam intake well 20'± max. at base.

Material: Turf X. Brush & Trees____. Rock fill____. Masonry____. Wood____.

Other_____.

Condition: 1. Good_____. 3. Major Repairs_____.

2. Minor Repairs X. 4. Urgent Repairs_____.

Comments: Brick masonry water stop exposed in several locations. Slope has eroded and slumped over years, but appears to have stabilized.

(8.) DAM DOWNSTREAM FACE: Slope 1:1 to highway 2:1 from highway.

Material: Turf X. Brush & Trees X. Rock Fill____. Masonry____. Wood____.

Other Rubbish, weeds and stumps from fallen trees on slope below highway.

Condition: 1. Good_____. 3. Major Repairs X.

2. Minor Repairs_____. 4. Urgent Repairs_____.

Comments: Gully near toe of slope - unable to locate outlet end 24" drain pipe. Water flowing out from slope over concrete block. Row of 6"-8" spruce at top of embankment slope.

(9.) EMERGENCY SPILLWAY: Available No. Needed No. If 24" pipe end is uncovered so it will flow free.

Height Above Normal Water _____ Ft.

Width _____ Ft. Height _____ Ft. Material _____.

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: _____

_____.

(10.) WATER LEVEL AT TIME OF INSPECTION: 4 Ft. Above _____. Below X.

Top Dam X F.L. Principal Spillway _____.

Other Note: Opening cut in wall of well house so water level is maintained 1 ft. below original elevation.

Normal Freeboard 4 Ft.

(11.) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment Yes - row 6 - 8" spruces at top of downstream slope. No hazard.

Animal Burrows and Washouts Yes - in slope of highway from top concrete block at toe - upslope 10 - 12 ft.

Damage to Slopes or Top of Dam Yes - See above. Also slope pitted where trees were uprooted.

Cracked or Damaged Masonry None noted - but brick masonry water stop exposed.

Evidence of Seepage Yes - Water is running out of embankment and over concrete block at toe. Source uncertain.

Evidence of Piping Yes - See above.

Leaks Yes - See above.

Erosion Yes - See washouts above.

Trash and/or Debris Impeding Flow No trash at inlet well.

Clogged or Blocked Spillway Yes - Outlet end of 24" drain pipe evidently covered by fill from widening of slope.

Other _____.

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed_____.
3. Conditionally safe - major repairs needed X .
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

This old reservoir has not been used as a water supply for about 18 years and an opening has been made in the top of the intake well so that the water level is about one foot below what was previously maintained. The gate to the 24" C.I. drain pipe is opened and a 4 inch valve allowing water to enter the intake well is maintained open. The dam embankment east of Route 202 is about 5 foot above the present top of the embankment for the highway. The Water Department carries out routine maintenance of the embankment and gate house. The gate house has been recently painted and the embankment's top and upstream slope mowed. There is a row of 6" to 8" spruces along the top of slope just inside a 6 foot chain link fence on the top of slope. A row of spruce on the highway side of the fence has been recently cut in connection with the current reconstruction of Route 202 by the Mass. Department of Public Works.

The old dam embankment appears stable and the grade of the top is level. The slope has slumped and eroded so that the width of the top is about 9 feet and in some areas the slopes are quite irregular. In one place the brick masonry water stop is exposed.

The Water Department Superintendent said that the gates and other equipment in the gate house are still in operating condition. Also, that the old pump house just below the dam is scheduled for removal. He did not know the exact location of the 24" C.I. drain pipe outlet but said that there was sufficient water flowing out to keep the reservoir from overflowing.

The outlet end of the 24" drain pipe was not found during this inspection. At the downstream toe approximately where the outlet should have been is a manhole built on top of a concrete block about 3 feet high and 13 to 18 feet long. A short 15" outlet pipe from the manhole projects over the brook bed below at the base of the

concrete block. A 10" concrete pipe enters the manhole from up the slope. This is the outlet end of a private storm drainage system installed under a State Highway permit in 1953. At this time the installer of the storm drainage system was supposed to have made provision for the drain pipe. The interior of the M H is dry.

There are several streams of water flowing out of the slope and over the concrete block which could be water from the 24" drain pipe buried in the widened slope.

The District recommends that the owner be advised to locate and clear the outlet end of the 24" drain.

RCS/vk

DESCRIPTION OF DAM

DISTRICT 2.

Submitted by R. C. Salls, P.E. Dam No. 2-8-275-7

Date October 24, 1973 ~~City~~/Town South Hadley

Name of Dam Leaping Well Reservoir Dam

---

1. Location: Topo Sheet No. 12B Mass. Rect. Coordinates N 451,200 E 311,700

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

On Leaping Well Brook just southeast of Granby Rd., (Rte. 202) about 7/10 mile northeast of Rte. 33. Embankment for Rte. 202 is adjacent and part of dam embankment.

---

2. Year built 1891 - date on plans filed with County Commissioners Year/s of subsequent repairs Unknown

---

3. Purpose of Dam: Water Supply Former water supply Recreational _____

Flood Control _____ Irrigation _____ Other Abandoned water supply

---

4. Drainage Area: 0.18 sq. mi. _____ acres.

Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban 15 Rural, Farm 15

Wood & Scrub Land 70 Slope: Steep _____ Med. _____ Slight 100%

---

5. Normal Ponding Area: 11 Acres; Ave. Depth 6 - 8

Impoundment: 28.7 million gals.; 88 acre ft.

Silted in: Yes X No _____ Approx. Amount Storage Area 10%

---

6. No. and type of dwellings located adjacent to pond or reservoir _____

i.e. summer homes etc. 1 residence adjacent to pond.

---

7. Dimensions of Dam: Length 265'± main dam, 200'± dike on N. side pond Max. Height 26'+

Freeboard 3'-2"

Slopes: Upstream Face 2:1

Downstream Face 2:1

Width across top 9'±

Dam No. 2-8-275-7

8.

Classification of Dam by Material:

Earth X Conc. Masonry _____ Stone Masonry _____
Embankment Brick masonry
Timber _____ Rockfill _____ Other water stop

8A.

Dam Type: Gravity X Straight X Curved, Arched _____ Other _____
Overflow _____ Non-overflow _____

9.

A. Description of present land usage downstream of dam:

85 % rural; 15 % ~~urban~~ developed

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes X No _____

C. Character Downstream Valley: Narrow X Wide _____ Developed _____
Rural 85 Urban 15

10.

Risk to life and property in event of complete failure.

No. of people 4 - 5

No. of homes 4 - 5

No. of businesses None

No. of industries None Type _____

No. of utilities 5 Type Electrical - telephone - gas and water - plus sewer in Route 202

Railroads None

Other dams Sunset Beach Complex Dams No. 2-8-275-8 and 2-8-275-8A

Other Possible damage to culvert at Mosier St. and bridge at Route 202 over Stony Brook.

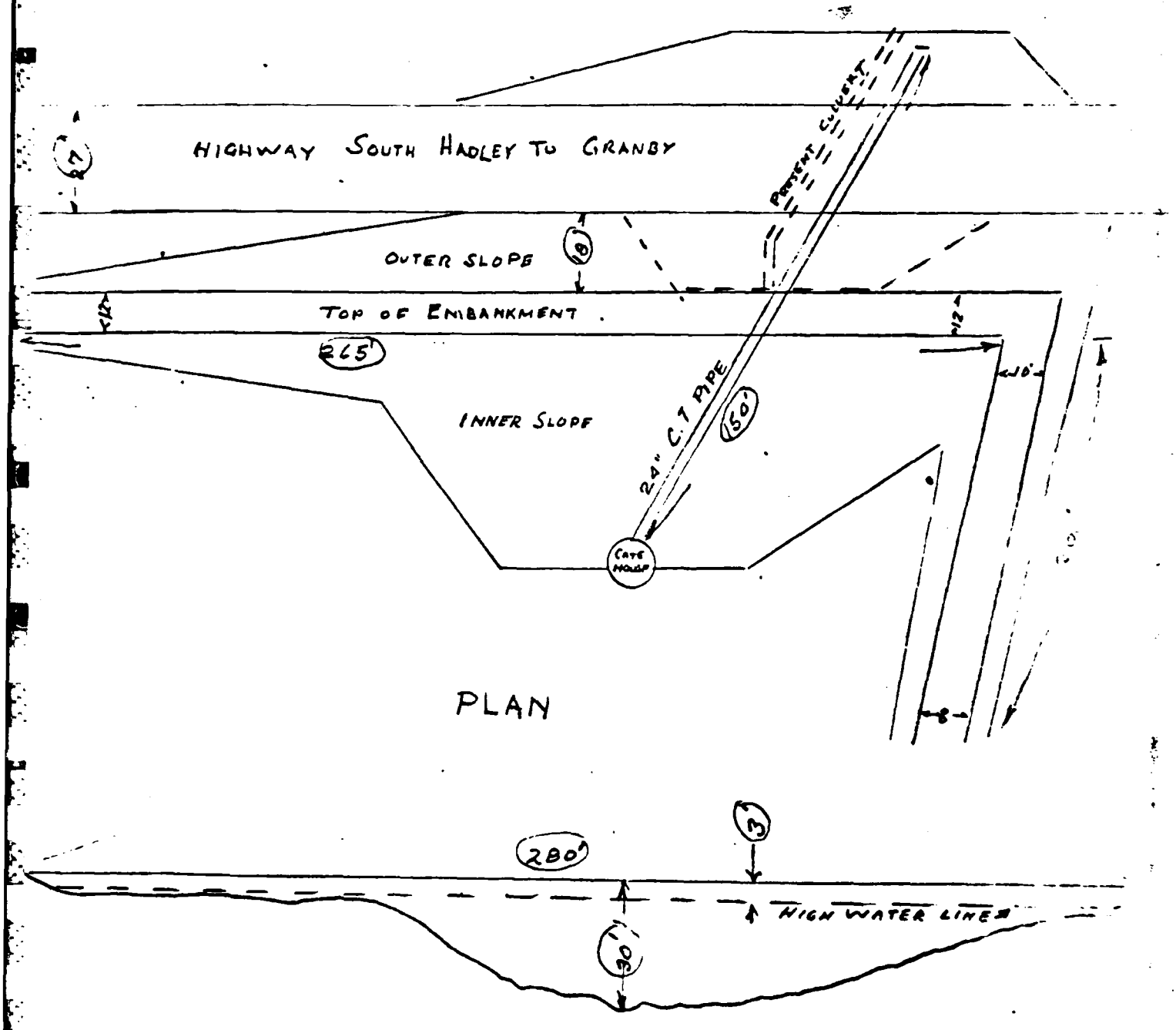
11.

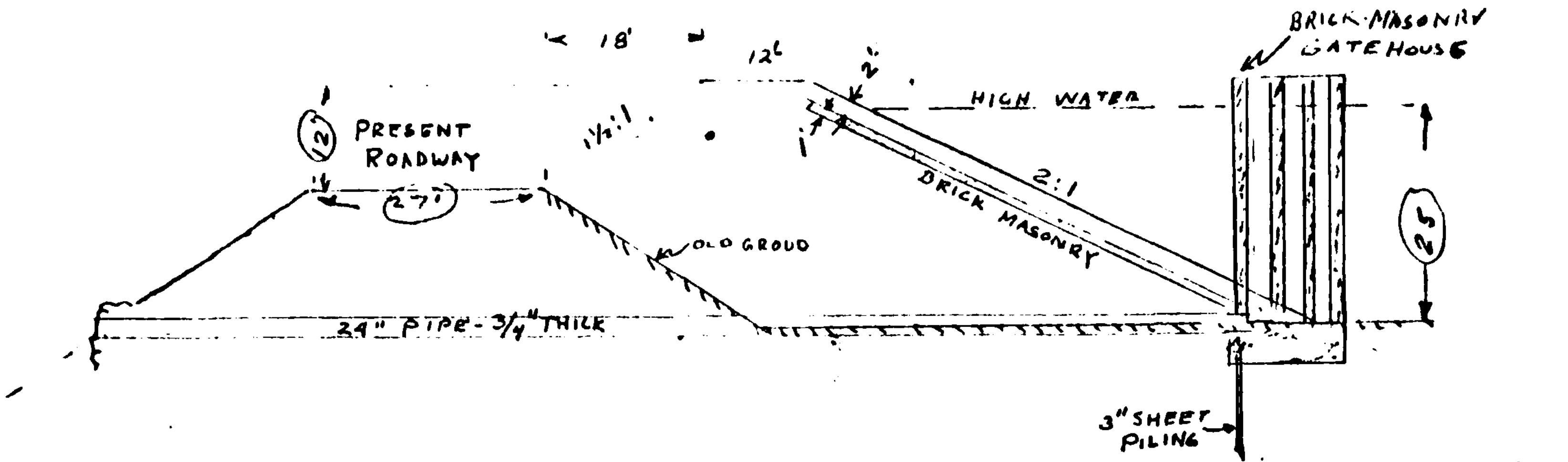
Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

RCS/vk
Attachments
Locus Plan
Sketches

DAM NO 2-8-[illegible]
LEADING WELL RESERVOIR

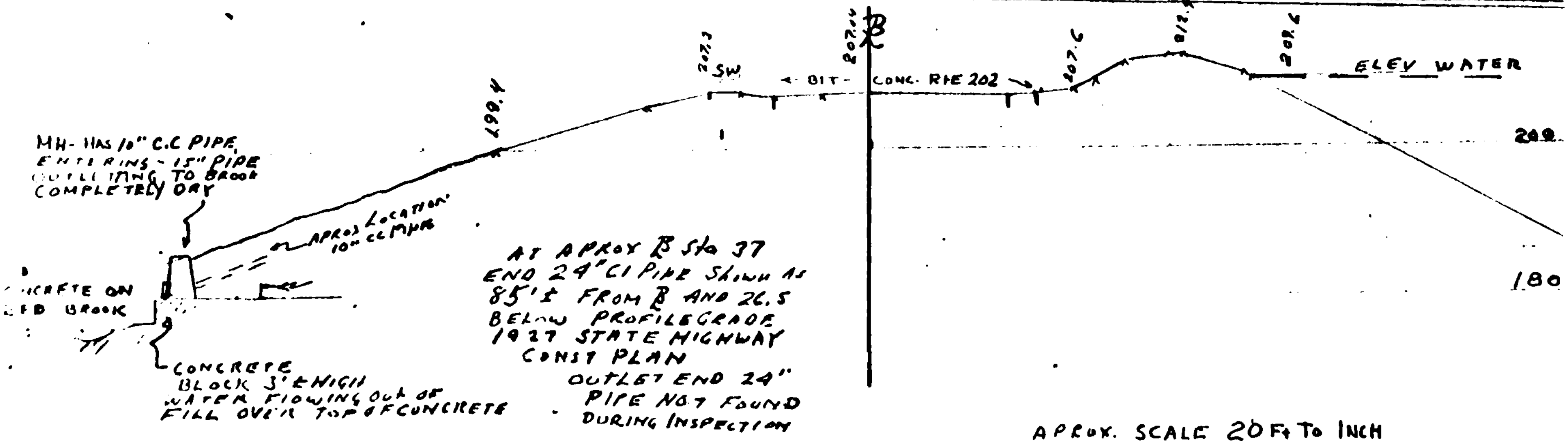
PLAN OF DAM COPIED FROM PROPOSAL PLAN
FILED WITH HAMPSHIRE COMMISSIONERS SEPT 1, 1891
FILE NO. 95 SEE ALSO VOL 13 - Pgs. 208 & 209
MEASUREMENT SCALED FROM PLAN CIRCLED-THUS (16)
PLANS PREPARED BY W W STRONG CIVIL ENGINEER





APROX SCALE 20' to Inch

X SECTION- TAKEN FROM 1891 PLAN ON FILE AT COUNTY COMMISSIONERS OFFICE - MEASUREMENT CIRCLED SCALED - (10)



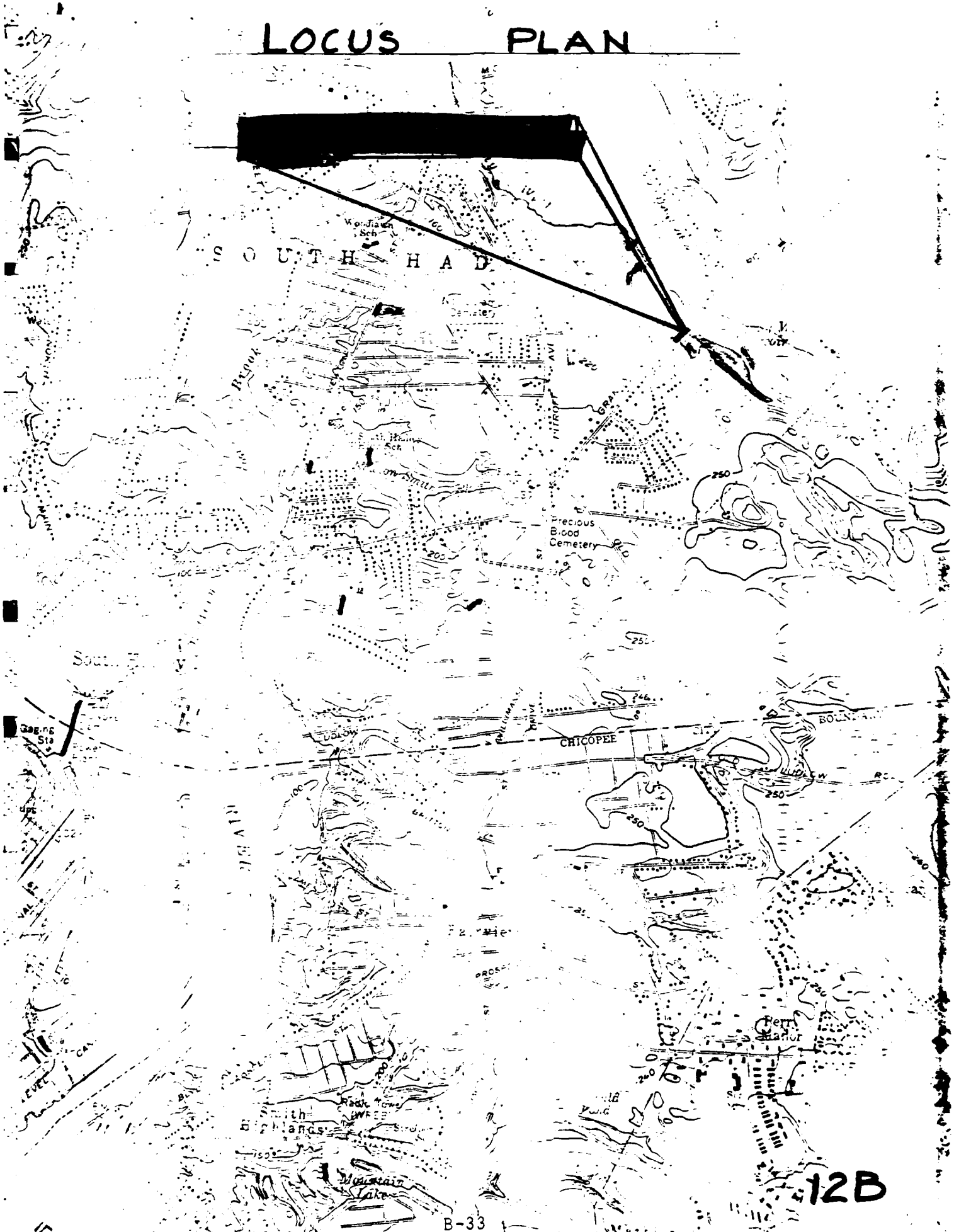
APROX. SCALE 20 Ft To INCH

COMPOSITE X SECTION. PREPARED FROM INFO. FROM 1927 CONST PLAN & FROM X SECTION FOR

1 Oct 1973

DAM NO 2-8-227

LOCUS PLAN



12B

OK FILE

Leaping Well Reservoir Dam #2-8-275-7

South Hadley

Addendum to Remarks and Recommendations of the Inspection Report dated 10/24/73:

During our October 24, 1973 inspection, the outlet end of the 24" C.I. pipe outlet was not located. Water was running out of the toe of slope around a concrete block approximately 94' from the base line for Route 202 and about 64' from the top of slope and edge of the 1927 State Highway Layout.

On the concrete block a manhole has been built on the outlet end of a 10" Town storm drain with one length of 15" pipe outletting into the brook below. The 10" pipe into the manhole runs down the slope from a manhole located near the top of the slope within the State Highway Layout. The storm drain crosses Route 202 and drains a Town street, "Ridge Road". This drain was installed in the State Highway in 1953 under a DPW Permit No. F-7672, dated June, 1953. This 10" storm drain line down the slope is almost all outside the State Highway Layout on the property of Fire District No. 1. It appears to have been built over the 24" cast iron pipe outlet for the Leaping Well Reservoir.

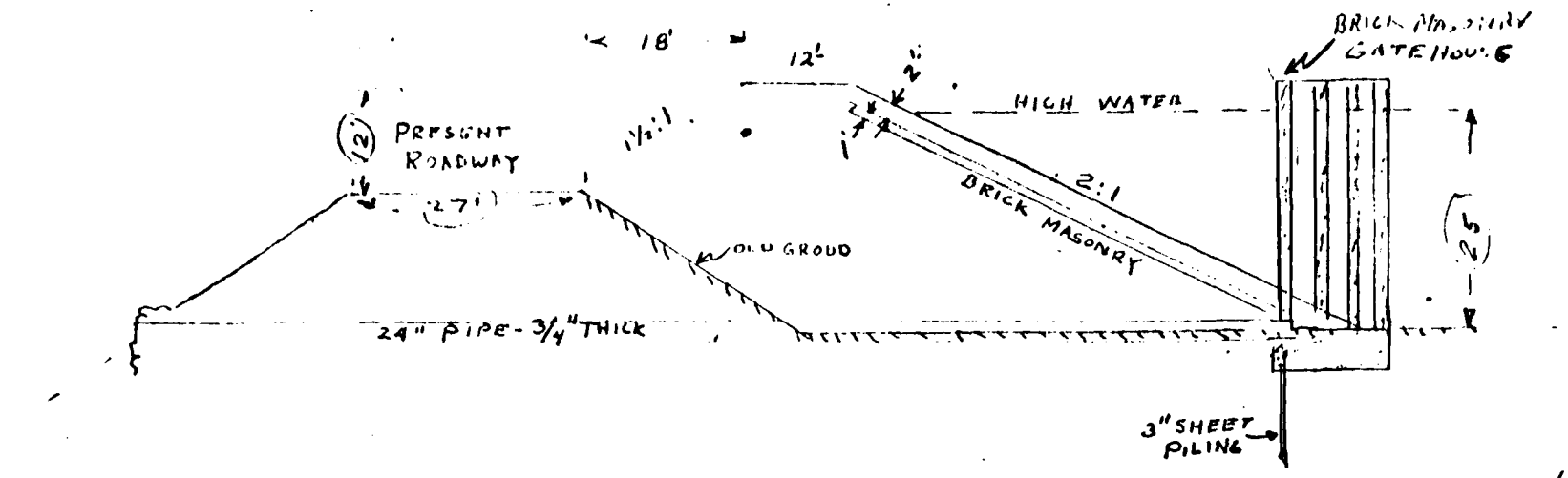
The 1927 State Highway Construction Plan shows the end of the 24" outlet pipe located at Station 37± and about 85' right of the 1927 base line, or about 55' outside the Layout, and its invert is 26.5' below profile grade. It appears that this was the location of the outlet before highway construction in 1927. Drainage sketches prepared after construction do not show the reservoir outlet pipe and it appears that it was not disturbed by the construction.

During the 1973 resurfacing project only a shallow fill was placed on the top of the slope to allow construction of a sidewalk just inside the Layout. The Layout line is just behind the sidewalk at the top of slope.

It appears that additional fill was placed on the slope since the 1927 construction covering the existing 24" pipe some time ago. It is evident that if any damage was done due to the unregulated dumping, it was done outside the State Highway Layout. Dumping in the gully is still in progress with material encroaching onto the brook bed downstream of the storm drain outlet.

RCS/fm

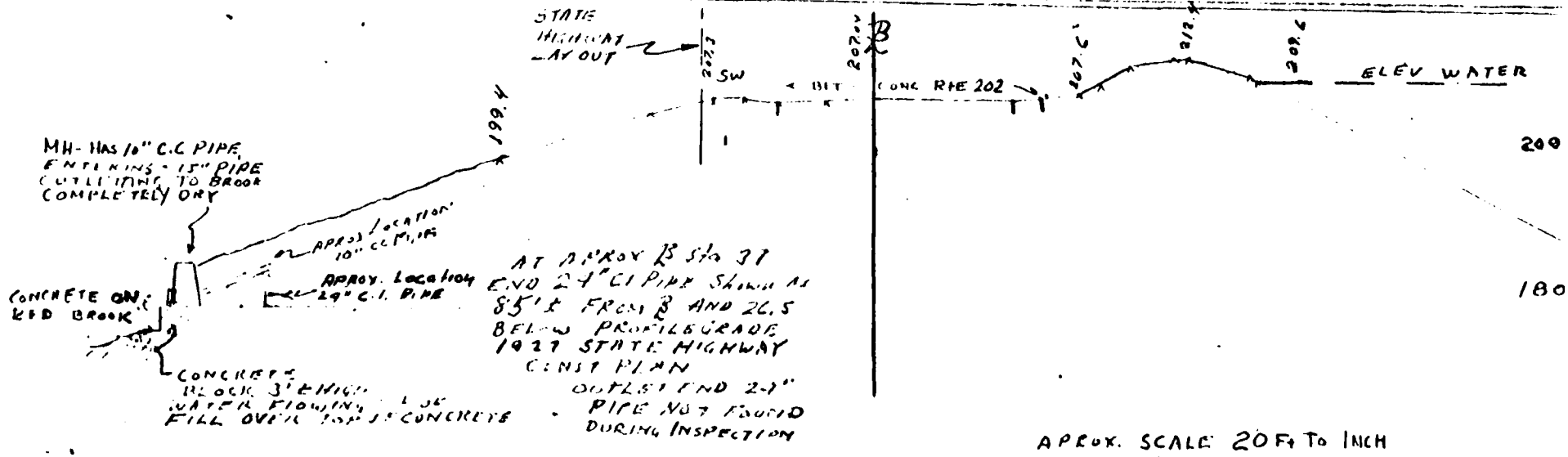
DAM No. 2-8-475-7



X SECTION - TAKEN FROM 1891 PLAN ON FILE AT COUNTY COMMISSIONERS OFFICE - MEASUREMENT CIRCLED SCALED - (10)

APROX SCALE 20' to INCH

B-35



APROX. SCALE 20 Ft To INCH

COMPOSITE X SECTION - PREPARED FROM INFO. FROM 1927 CONST PLANS & FROM X SECTION FOR

DAM# 2-8-275-7

Dept. Of Public Works
DIVISION OF WATERWAYS

[illegible] 1974

ASSOCIATE COMMISSIONER

October 29, 1974

SUBJECT: A-South Hadley
Leaping Well Reservoir Dam

Mr. Robert T. Tierney, P.E.
Chief Engineer
Mass. Dept. Public Works
100 Nashua Street
Boston, Massachusetts 02114

ATTN. TO: Mr. Sherman Eidelman
Deputy Chief Engineer for Maintenance

Dear Sir:

The matter of the Leaping Well Reservoir Dam has been referred to the Maintenance Section in this office for further investigation.

We have reviewed all of the correspondence that has been made available to us by the Waterways Division, the District Dam Engineer, Mr. George McDonnell of Tighe & Bond, and the Water Department Fire District No. 1 of South Hadley. The District Maintenance Engineer has made a field inspection and had a new cross section and detail taken at the location in question.

It is the contention of the Fire District and Mr. McDonnell, the Town's Consultant, that at some time in the past (Mr. McDonnell says the 1920's) the Department extended the existing 24 inch cast iron pipe with a 24 inch corrugated metal pipe either to support the roadway embankment or because we had surplus excavation to be wasted. Both of these statements have been made.

We can find no record of any agreement or easement concerning this matter in the District files and the Town can produce none either. They allege that this work was done in accordance with a verbal agreement between the unknown parties involved.

The sole support for the Town's argument is the recollection of a retired employee. Some time in the 1920's is apparently as accurately as this event can be dated.

As stated in the reports submitted by the Dam engineer, the 1927 construction plans show the 24" cast iron outlet located some 65 feet from the highway baseline. There is no indication that the then existing stone header was in any

October 29, 1974

SUBJECT: M-South Hadley
Leaping Well Reservoir Dam

Mr. Robert T. Tierney, P.E.

Page Two

way disturbed nor the slope affected by the highway construction. There is no indication at present of the stone header shown on the 1927 plans.

Our records do reveal that in 1953 a Permit, #P-7672, was issued to the Town of South Hadley to install a drainage system within the State Highway Layout. This Permit was issued as a result of negotiations between the Town and this Department. Originally, a private contractor asked to connect the drainage from his development to the Department's storm drainage system. Sufficient capacity was not available to allow this connection. The developer would have been required to construct a new system within the highway layout. At the request of the Town, the Department issued a Permit to the Town to install three manholes and some 550 feet of pipe within the layout. The planned outfall for this system was in the brook at the dam overflow header. The Department's only interest in this system was for that portion within the layout. The construction outside the layout was the concern and responsibility of the Town. The headwall to be constructed at the outfall in the brook was never constructed as shown on the plans submitted in 1953. This was not, and still is not, of concern to this Department. The 24 inch corrugated pipe referred to by the Town was not seen by any Department personnel that investigated this matter.

From our review of the available information, it is our opinion that this Department is in no way responsible for the condition of the overflow drain from the reservoir.

From the cross section taken during our investigation, it appears that the outlet pipe length might be cut back 9 feet by the Town and still maintain a 2:1 slope on the embankment.

Very truly yours,

Francis J. Hoey

FRANCIS J. HOEY, P.E.
District Highway Engineer

AWC/fm
C-MEG
JFK
AWC

200

3479

#2

190

SOUTH

180

10-23-74

PRELIMINARY

DATE 19

DATE 19

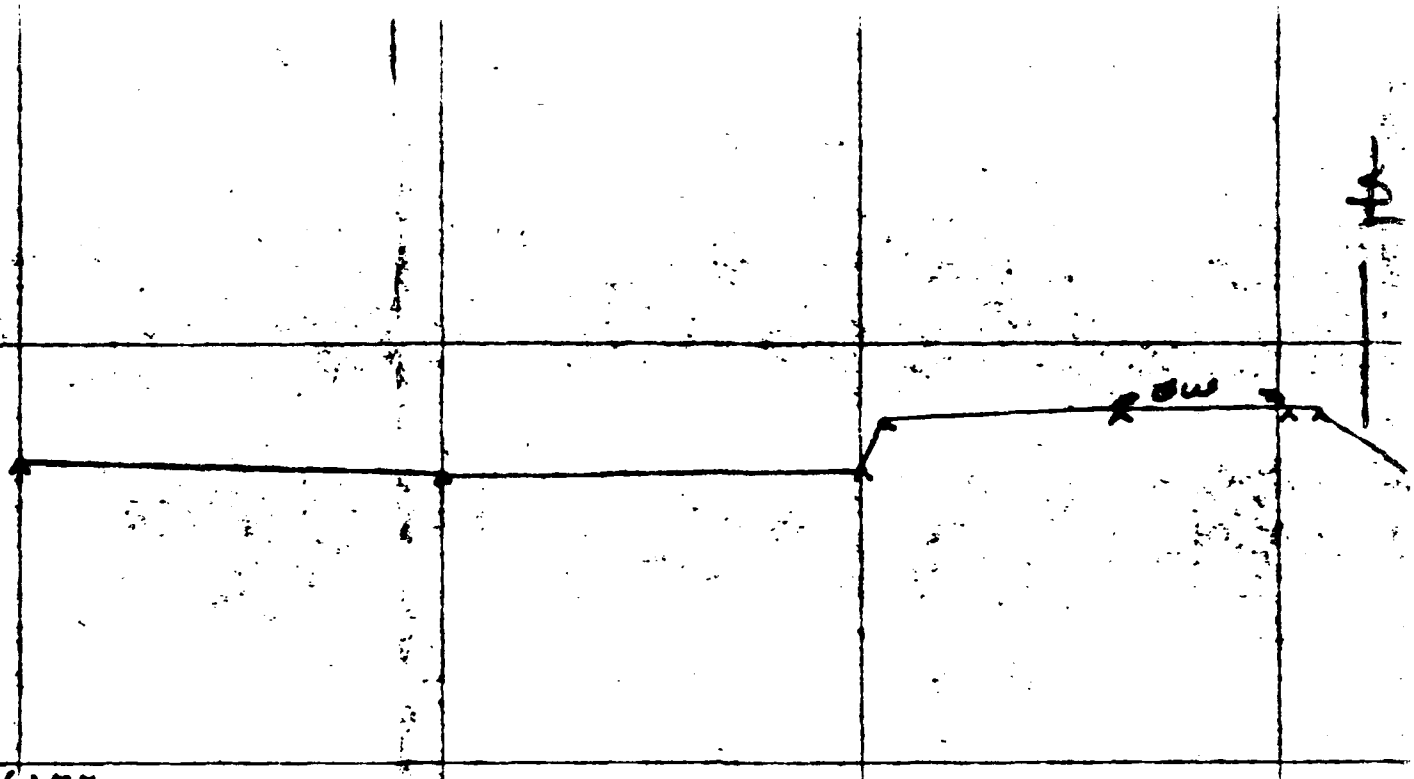
BOOK NO. PAGE

TEMPLATES

DATE 19

DATE 19

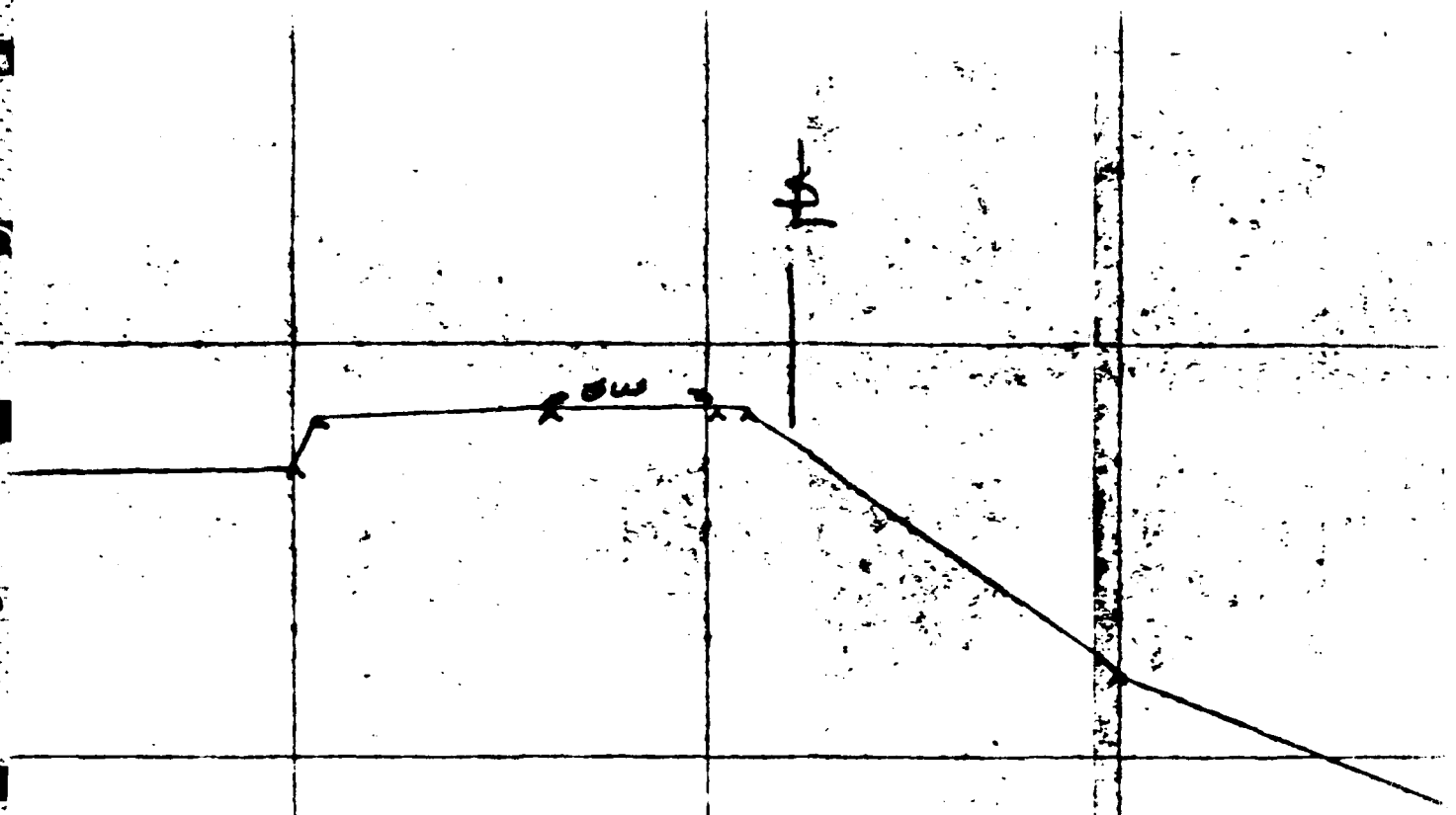
BOOK NO. PAGE



36+77

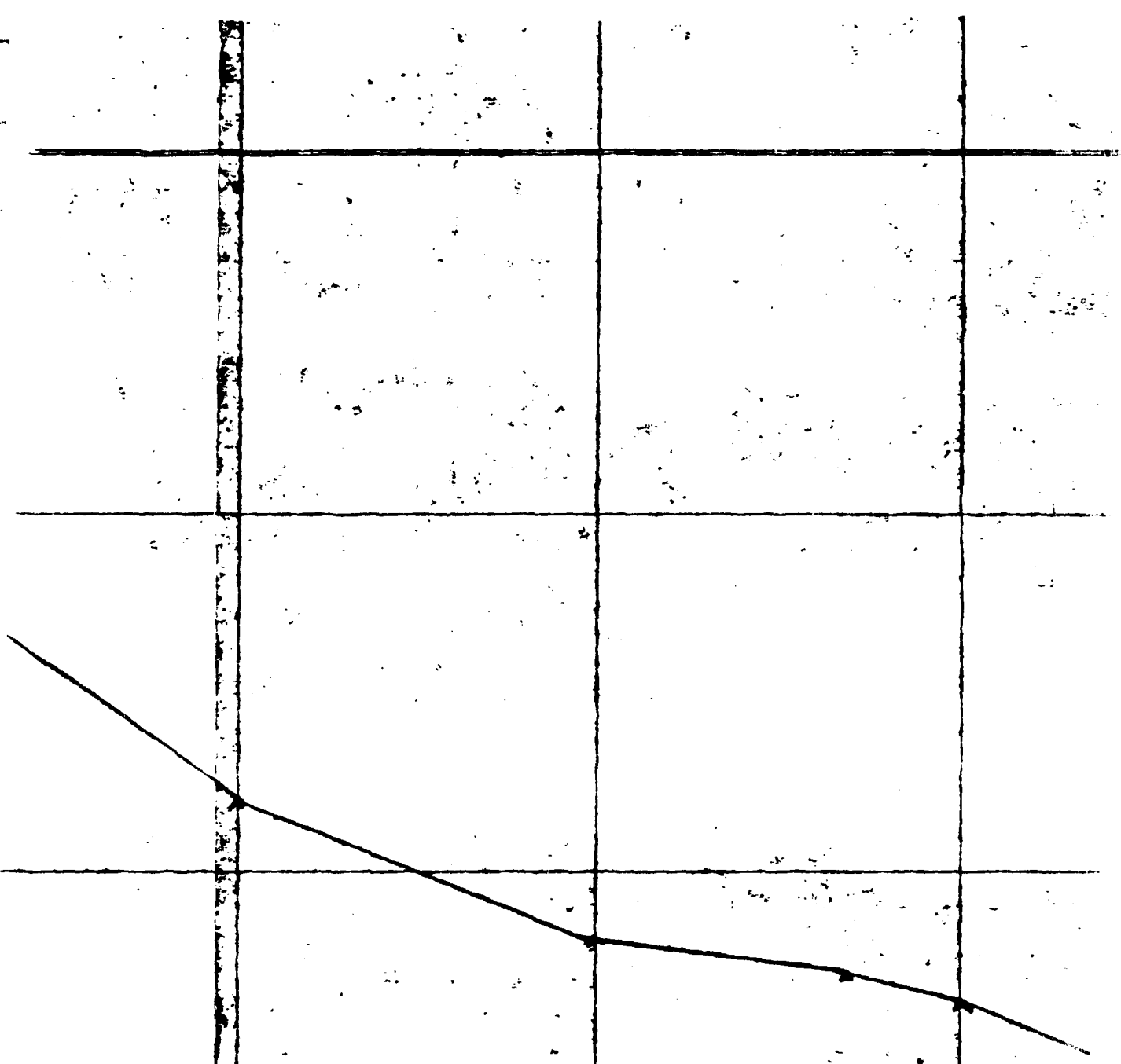
SOUTH HADLEY Rte 202

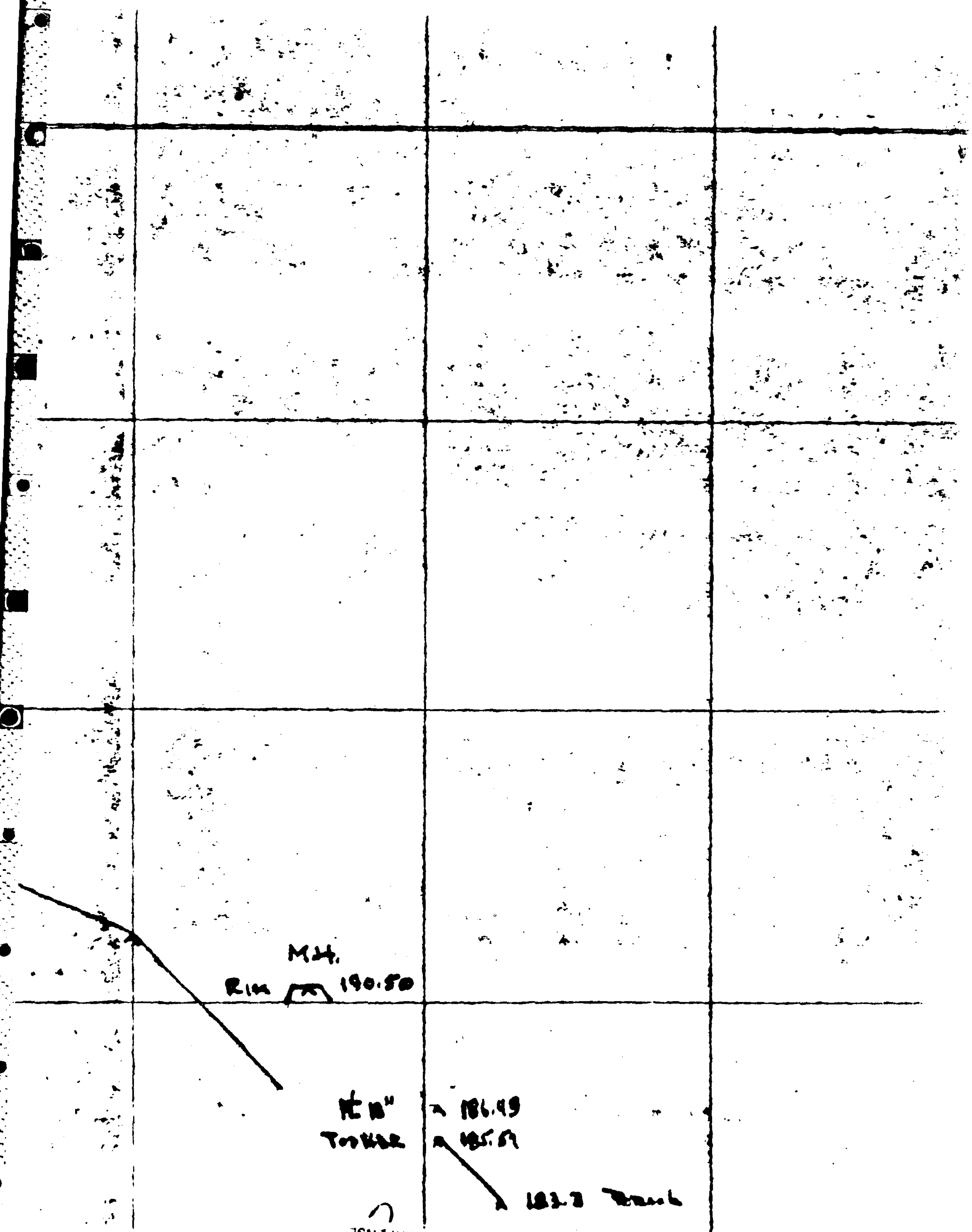
10-23-74 ND 19563 Pg 50, 51



Hadley Rte 202

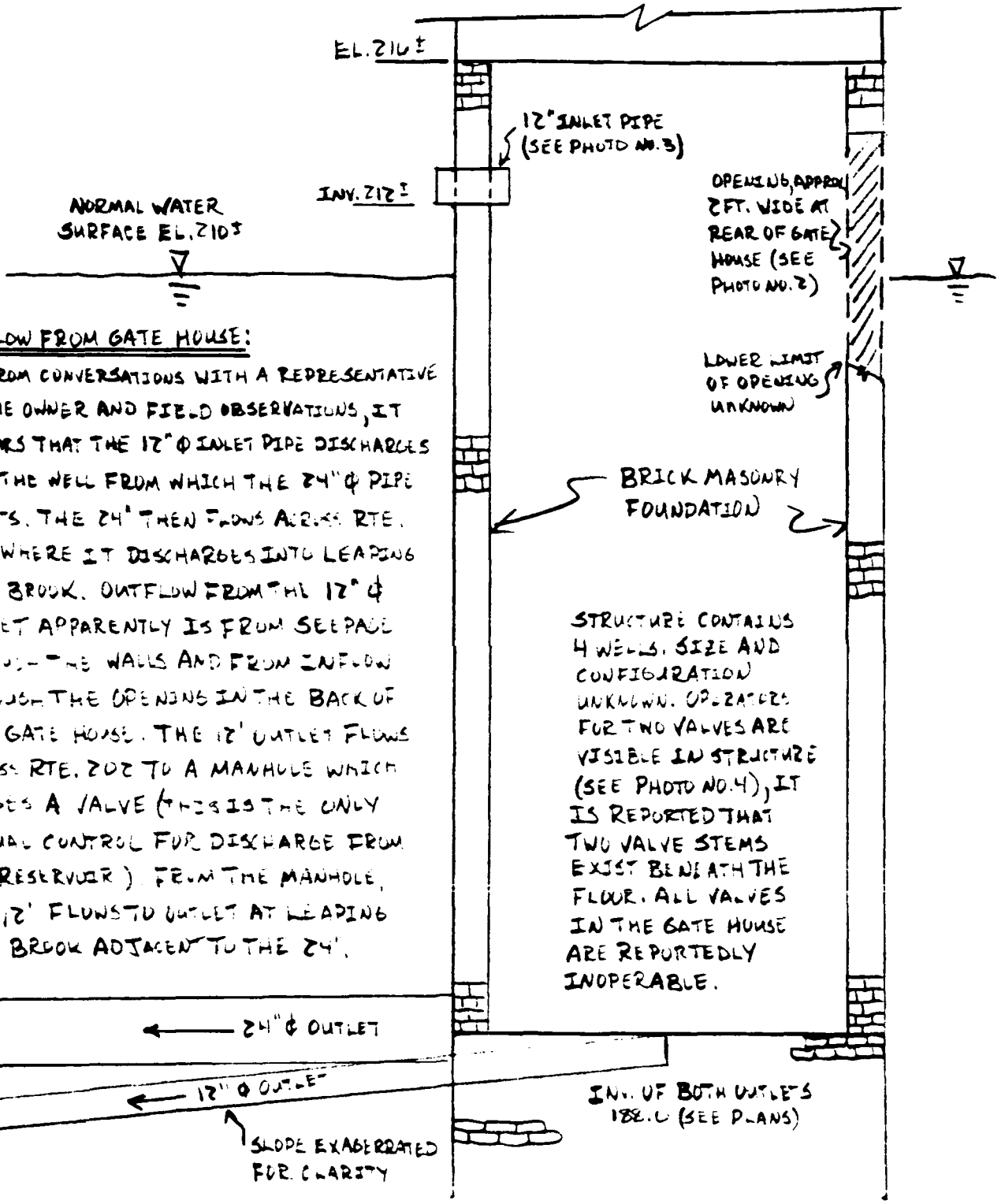
NB 19563 Pg 50, 51




M.H.
Rim 190.50

CLIENT / PROJECT U.S. Army COE / Non-Federal Dams DATE _____ JOB NO _____

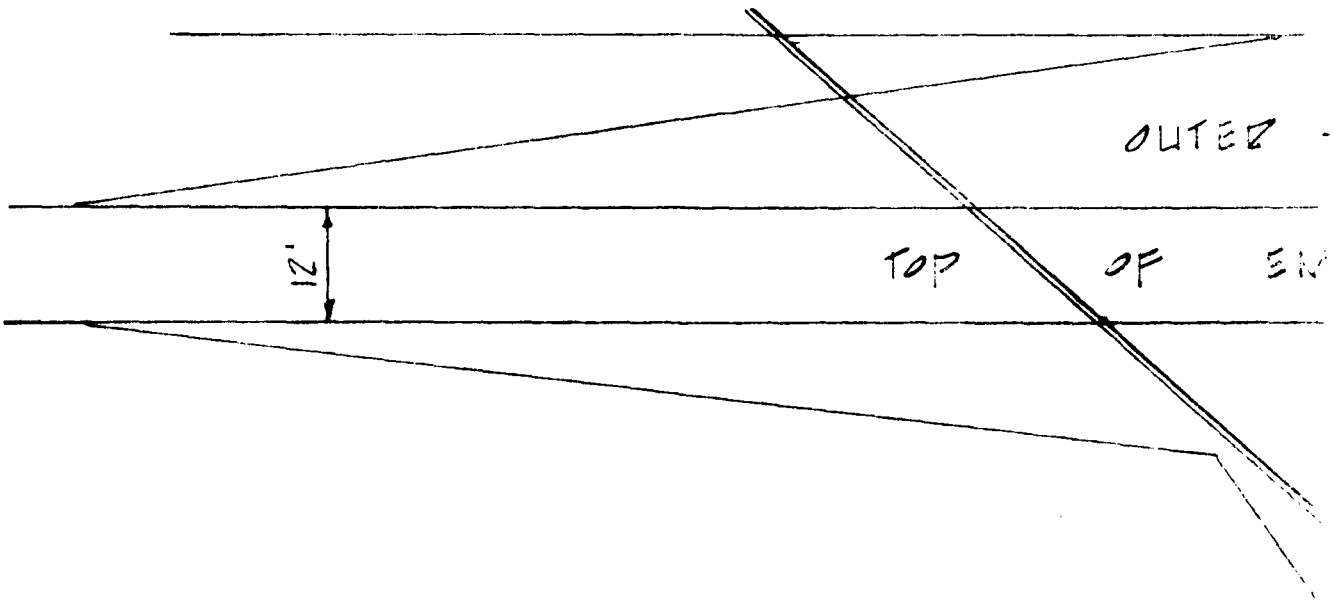
SUBJECT Leaping Well Reservoir - Gate House Sketch BY _____ CHKD BY _____ SHEET ____ OF ____



OUTFLOW FROM GATE HOUSE:

FROM CONVERSATIONS WITH A REPRESENTATIVE OF THE OWNER AND FIELD OBSERVATIONS, IT APPEARS THAT THE 12" ϕ INLET PIPE DISCHARGES INTO THE WELL FROM WHICH THE 24" ϕ PIPE OUTLETS. THE 24" THEN FLOWS ACROSS RTE. 202 WHERE IT DISCHARGES INTO LEAPING WELL BROOK. OUTFLOW FROM THE 12" ϕ OUTLET APPARENTLY IS FROM SEEPAGE THROUGH THE WALLS AND FROM INFLOW THROUGH THE OPENING IN THE BACK OF THE GATE HOUSE. THE 12" OUTLET FLOWS ACROSS RTE. 202 TO A MANHOLE WHICH HOUSES A VALVE (THIS IS THE ONLY MANUAL CONTROL FOR DISCHARGE FROM THE RESERVOIR). FROM THE MANHOLE, THE 12" FLOWS TO OUTLET AT LEAPING WELL BROOK ADJACENT TO THE 24".

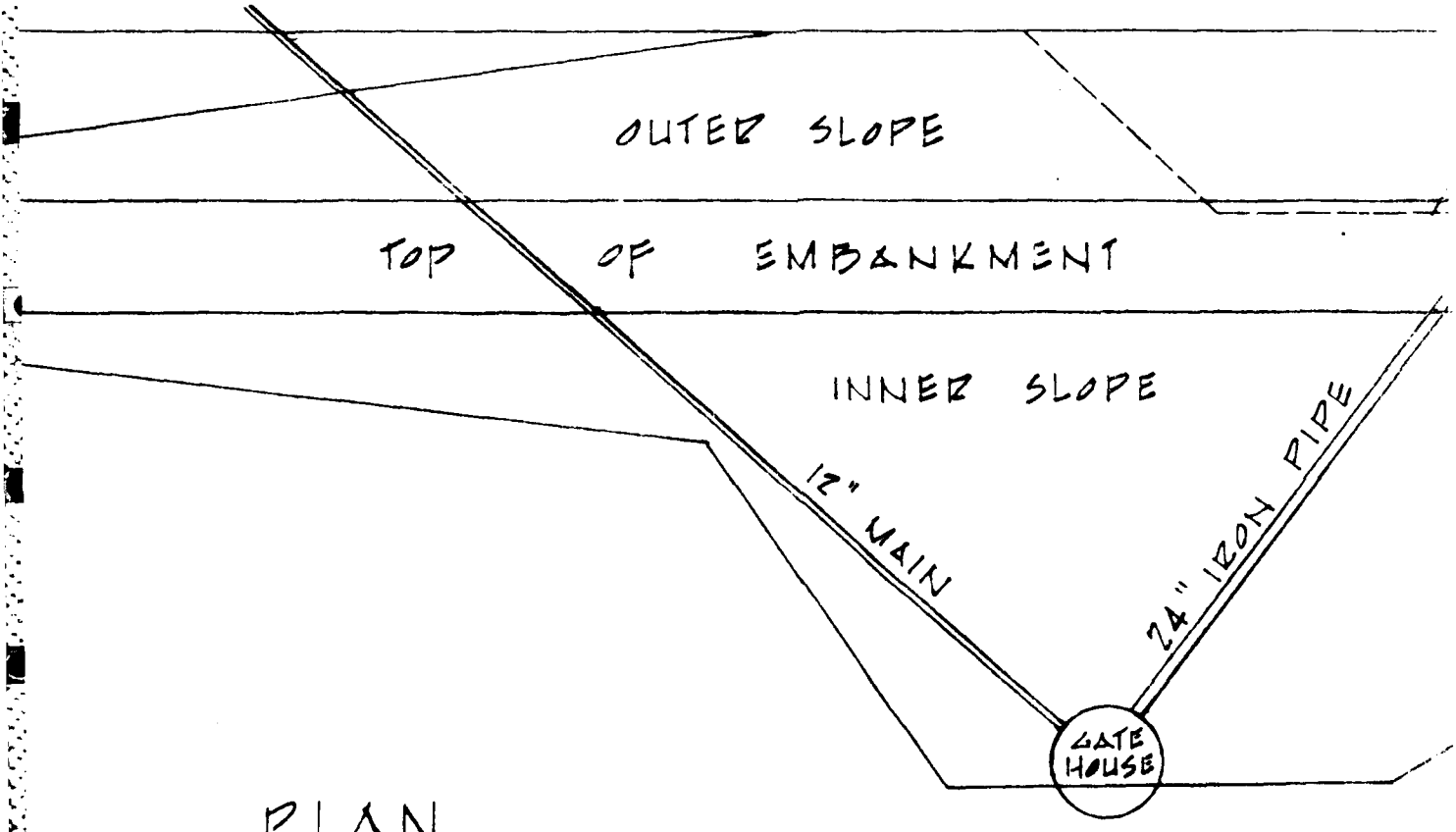
CULLINAN ENGINEERING CO., INC.
AUBURN · BOSTON, MASSACHUSETTS
CIVIL ENGINEERS — LAND SURVEYORS



PLAN
SCALE 1"=20'

NOTE: TRACING MADE FROM A PLAN OBTAINED FROM THE TOWN OF SOUTH HADLEY WATER DEPARTMENT. THIS DOES NOT NECESSARILY REPRESENT THE PRESENT CONFIGURATION OF THE DAM.

HIGHWAY, SOUTH HADLEY TO GRANBY



PLAN
SCALE 1"=20'

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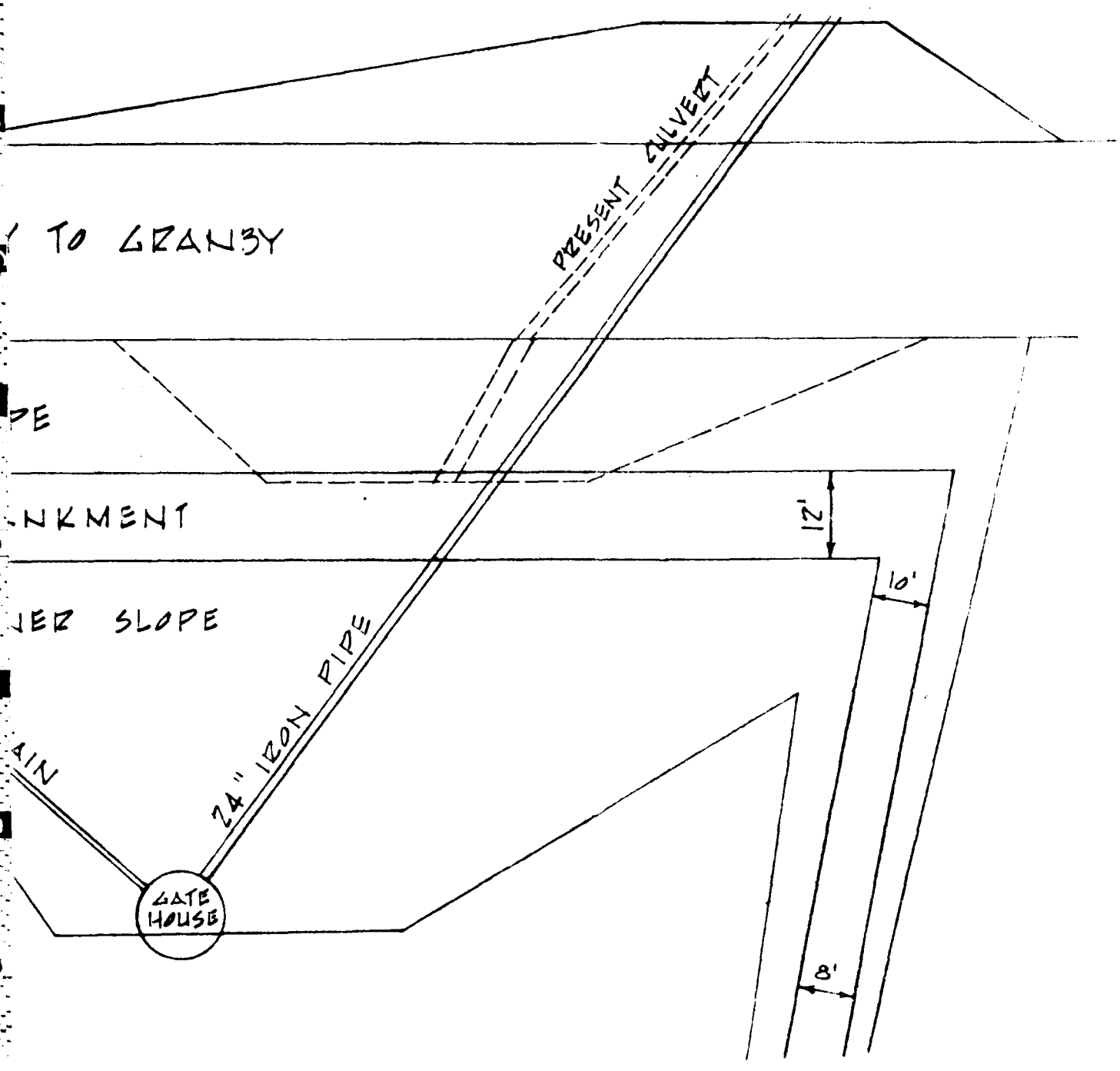
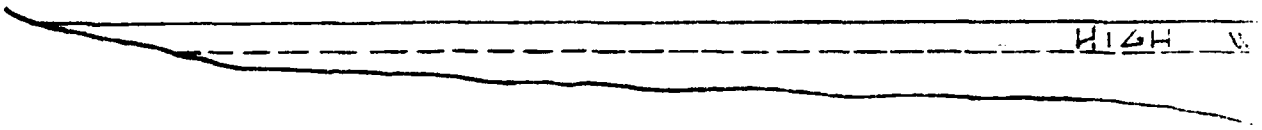
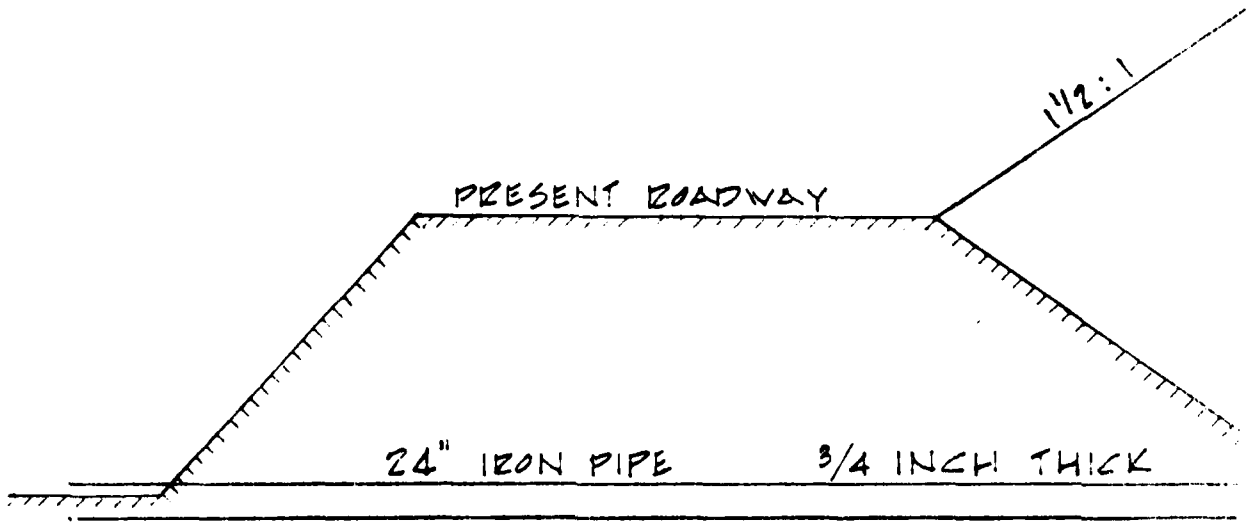


RESERVOIR DAM
FOR
SOUTH HADLEY FALLS WATER WORKS
SEPT 1891 W.W. STRONG, CIVIL ENGINEER
TRACED BY: CULLINAN ENGINEERING CO., INC
AUBURN - BOSTON MASSACHUSETTS

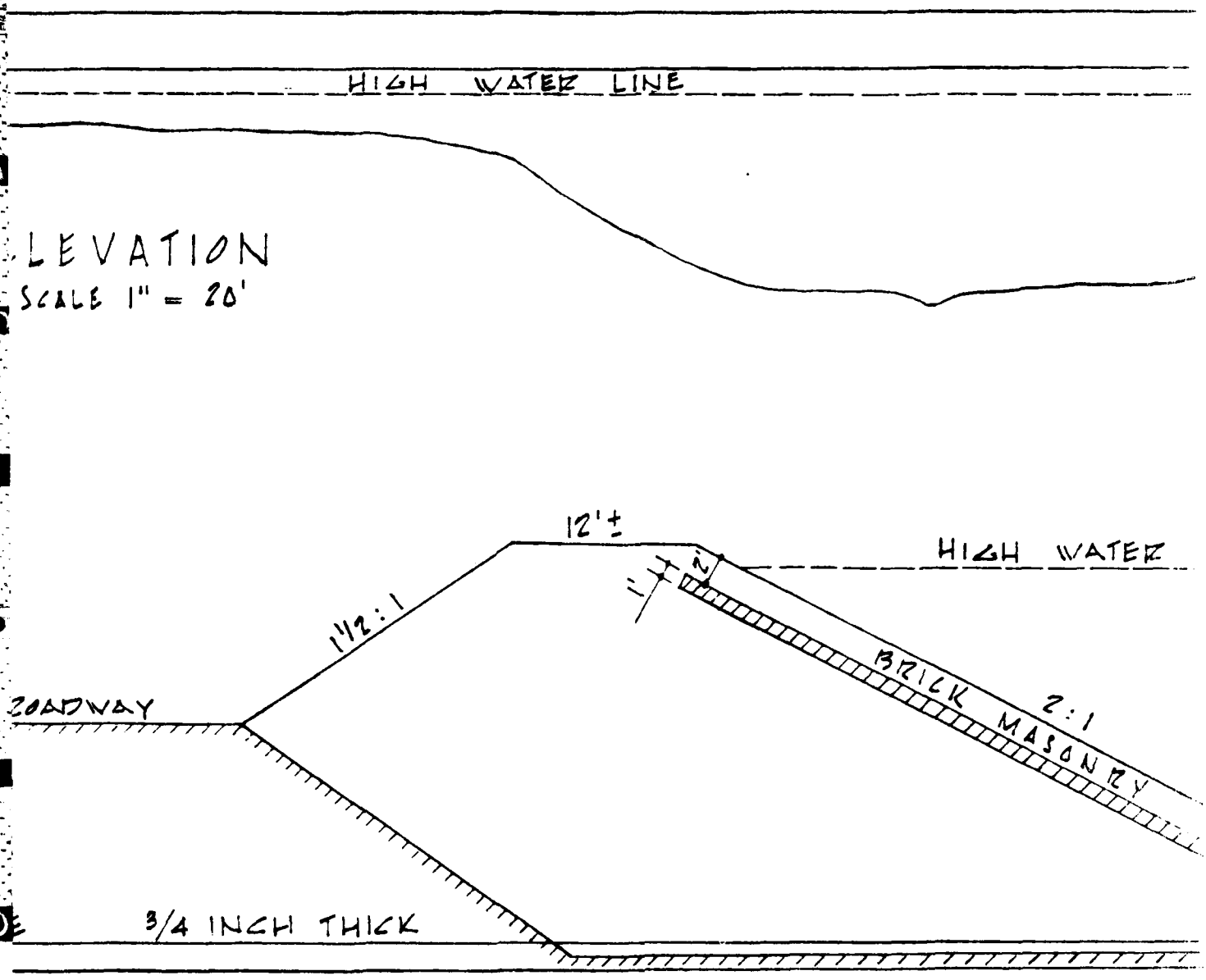


ELEVATION
SCALE 1" = 20'



SECTION
SCALE 1"= 10'

NOTE: TRACING MADE FROM A PLAN OBTAINED FROM THE TOWN OF SOUTH HADLEY WATER DEPARTMENT. THIS DOES NOT NECESSARILY REPRESENT THE PRESENT CONFIGURATION OF THE DAM.



LEVATION
SCALE 1" = 20'

ECTION
CALE 1"= 10'

PLAN OBTAINED
OUTH HADLEY
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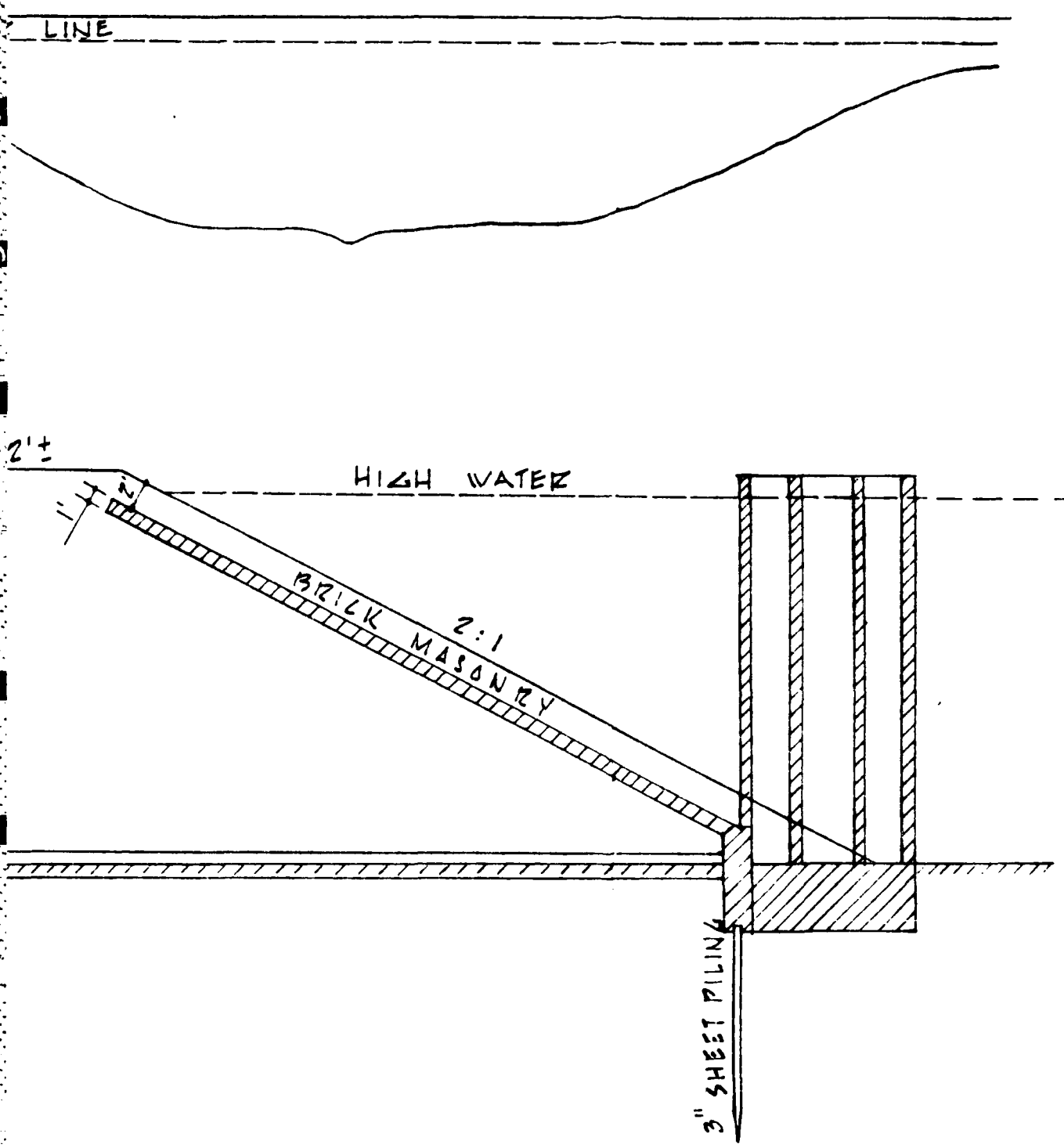
SOUTH H
SEPT. 189
TRACED BY
AUBJE



RESERVOIR DAM

FOR

SOUTH HADLEY FALLS WATER WORKS

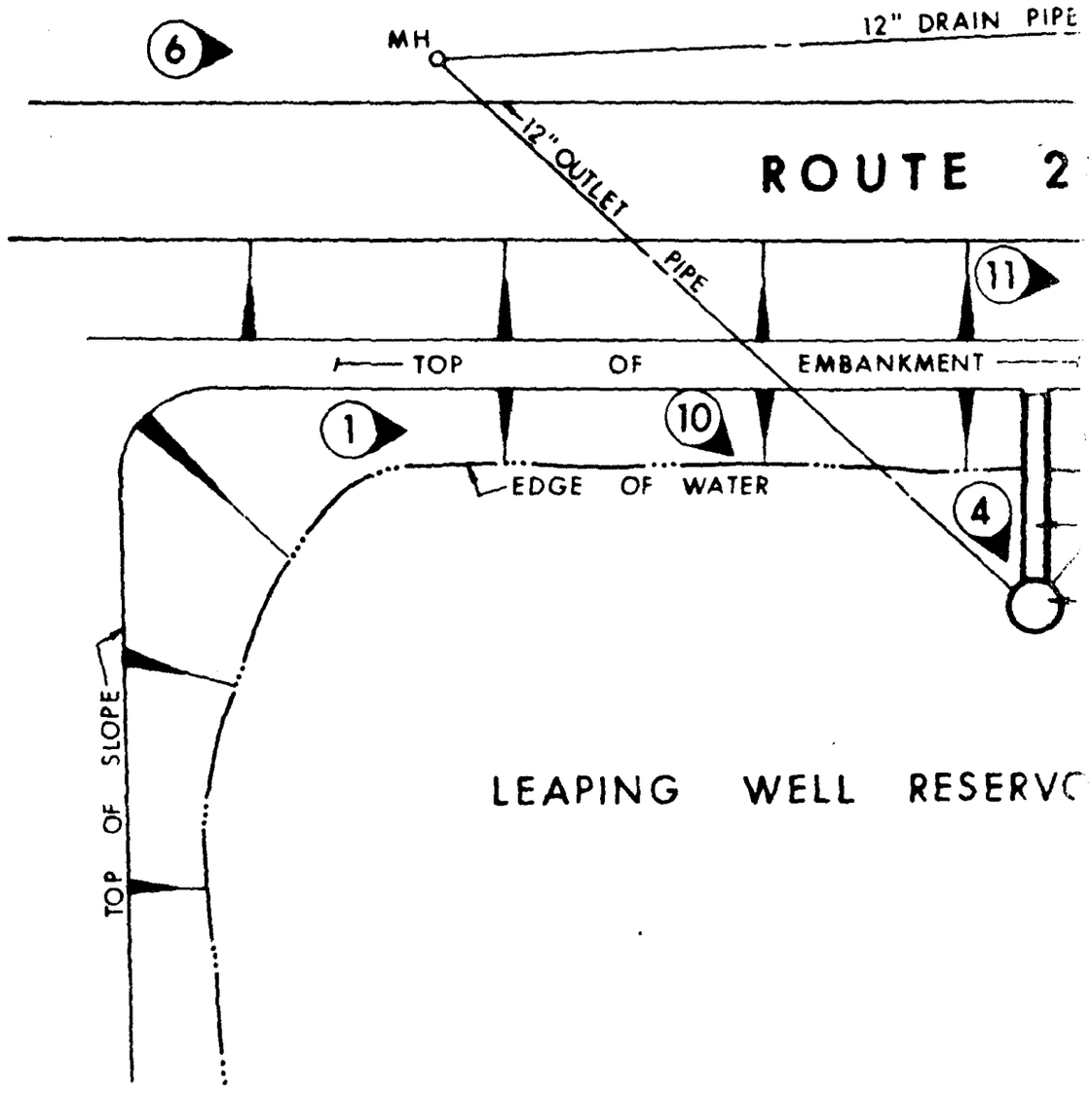
SEPT. 1891 W.W STRONG CIVIL ENGINEER

TRACED BY: CULLINAN ENGINEERING CO INC

AUBURN - BOSTON MASSACHUSETTS

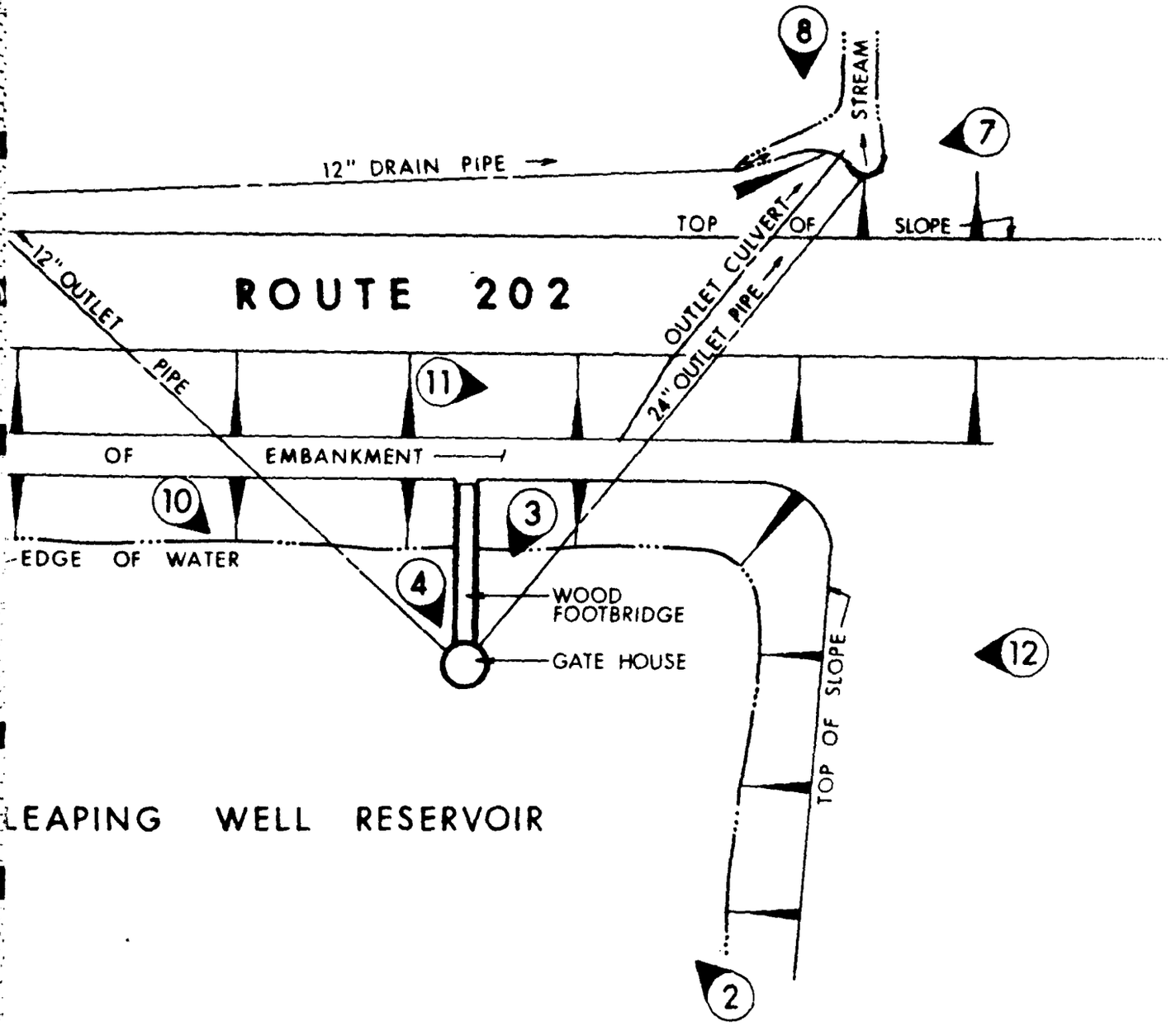
APPENDIX C

PHOTOGRAPHS



PLAN
NO SCALE

OVERVIEW

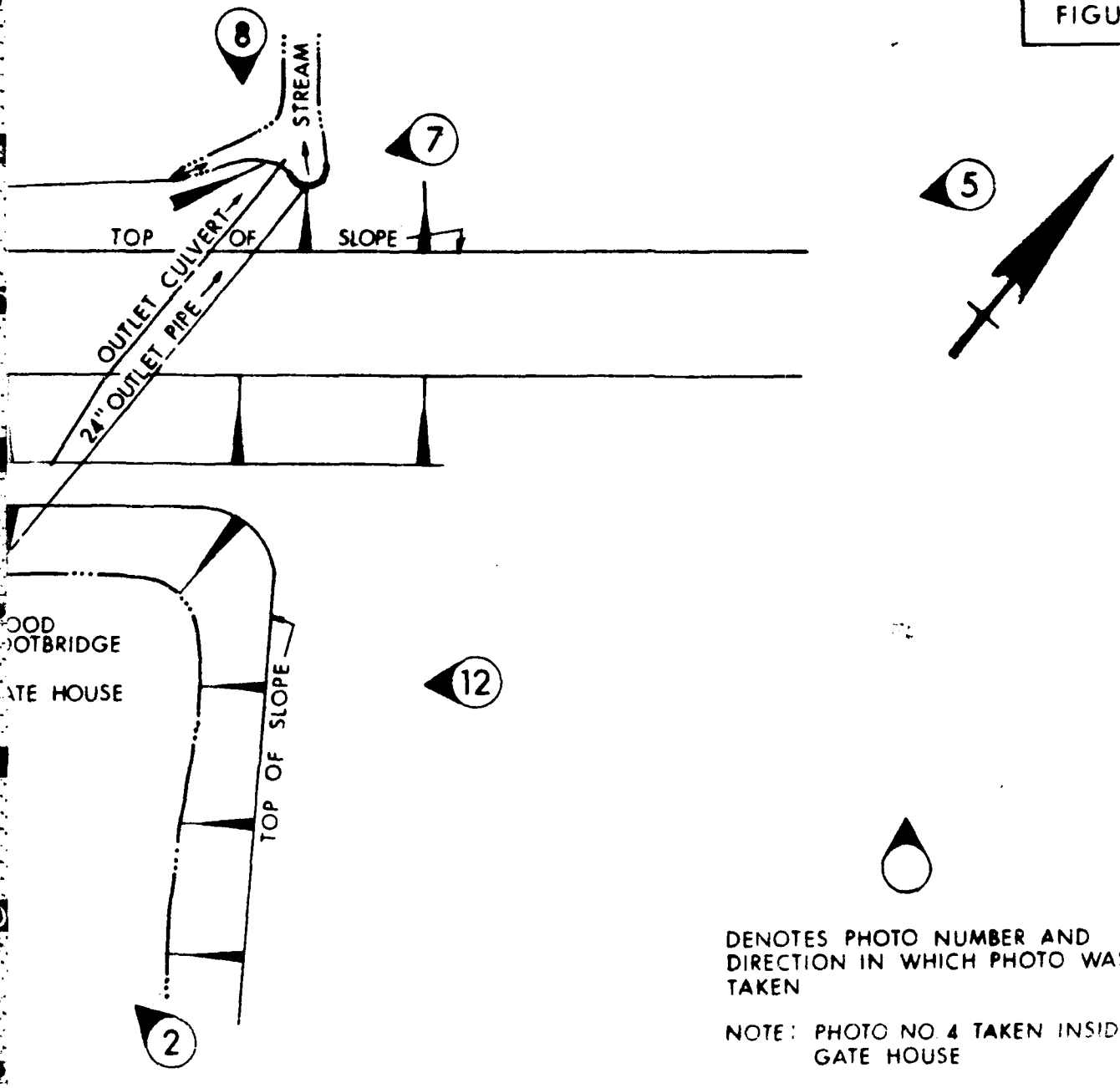


LEAPING WELL RESERVOIR

PLAN

NO SCALE

FIGURE 2



DENOTES PHOTO NUMBER AND DIRECTION IN WHICH PHOTO WAS TAKEN

NOTE: PHOTO NO. 4 TAKEN INSIDE GATE HOUSE

U.S ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION
WALTHAM, MASSACHUSETTS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PHOTO LOCATION PLAN
LEAPING WELL RESERVOIR
SOUTH HADLEY, MASS.

SCALE NO SCALE		DATE APRIL, 1981	
DWN NP	CKD GV	APP KH	PAGE C-1

CULLINAN ENGINEERING CO., INC
CIVIL ENGINEERS
AUBURN - BOSTON, MASSACHUSETTS

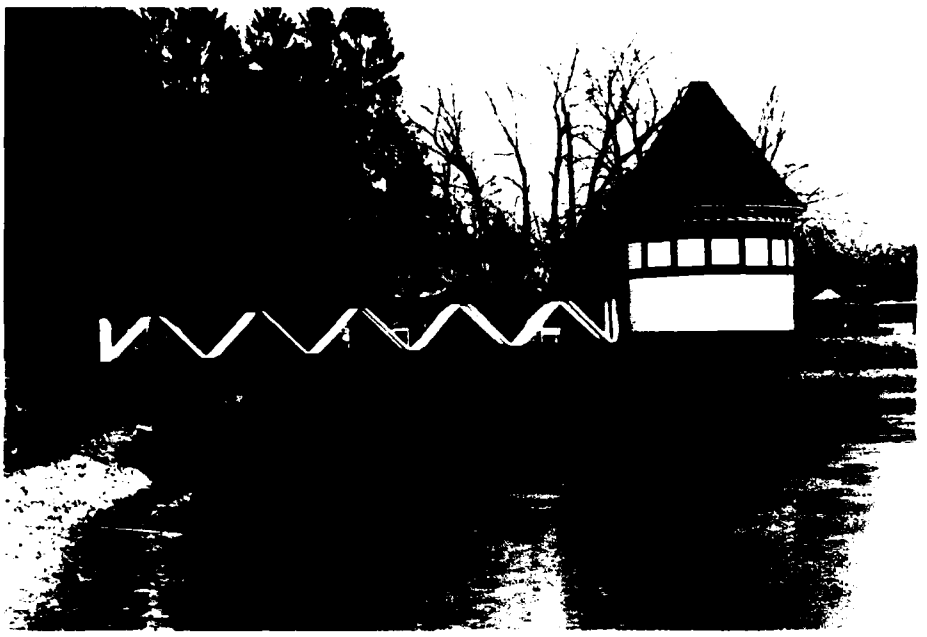


PHOTO NO. 1
VIEW OF GATE HOUSE AND FOOTBRIDGE -
NOTE DETERIORATION OF BRICK FOUNDATION

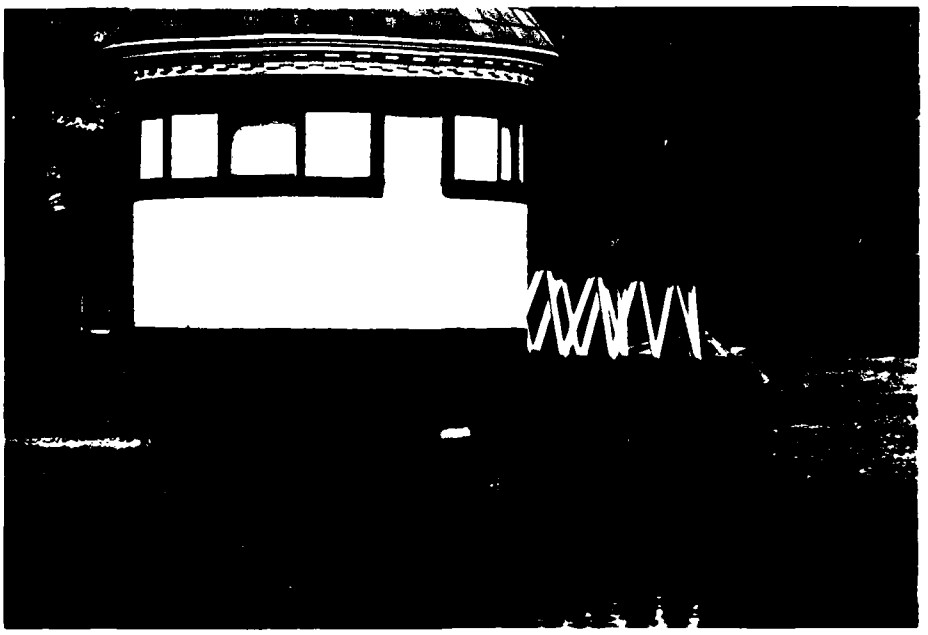


PHOTO NO. 2
VIEW OF REAR OF GATE HOUSE -
NOTE OPENING IN BRICK FOUNDATION

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

PHOTO NO. 3
VIEW OF FRONT OF GATE HOUSE FOUNDATION

PHOTO NO. 4
VIEW OF GATE OPERATORS INSIDE
GATE HOUSE (REPORTEDLY NON-FUNCTIONING)

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

PHOTO NO. 5
VIEW FROM LOW POINT IN ROADWAY
RIGHT OF DAM LOOKING TOWARDS DAM

PHOTO NO. 6
VIEW LOOKING TOWARDS LOW POINT IN
ROADWAY FROM OPPOSITE DAM - NOTE
MANHOLE CONTAINING VALVE ON 12"
OUTLET AT LEFT OF PHOTO

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

PHOTO NO. 7
VIEW OF OUTLET - NOTE
DISCHARGE FROM 12" OUTLET

PHOTO NO. 8
VIEW OF OUTLET LOOKING
UPSTREAM

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

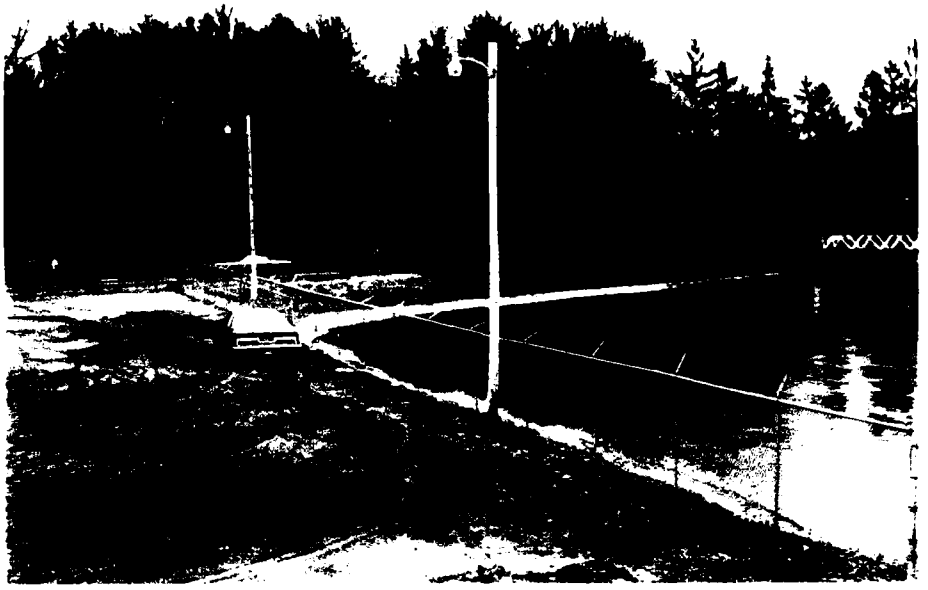


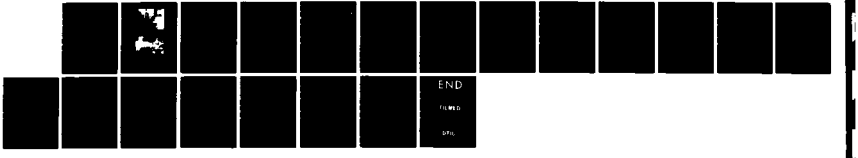
PHOTO NO. 9
VIEW OF WEST RESERVOIR RIM

PHOTO NO. 10
VIEW OF EAST RESERVOIR RIM

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

AD-A155 741 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
LEAPING WELL RESERVOI. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUN 81

UNCLASSIFIED F/G 13/13 NL



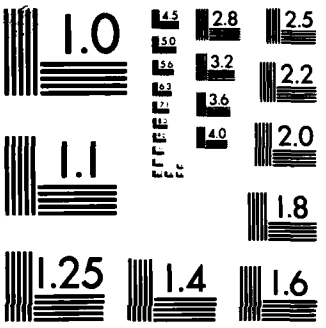


PHOTO NO. 11
VIEW OF DOWNSTREAM FACE OF NORTH UPPER EMBANKMENT - NOTE STUMPS AND ROOTS

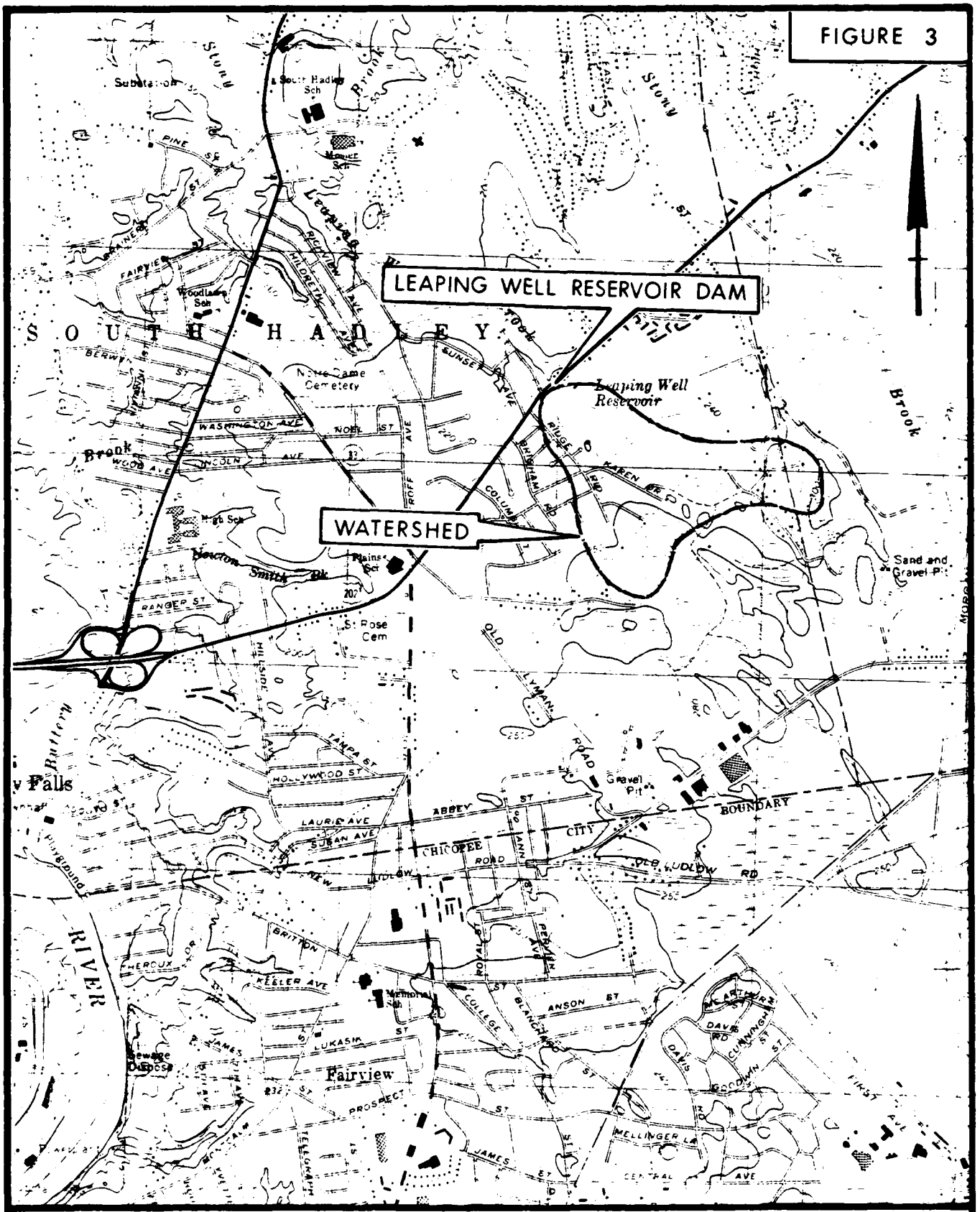
PHOTO NO. 12
VIEW OF EROSION AND ROOTS ON DOWNSTREAM FACE OF EAST UPPER EMBANKMENT

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Leaping Well Reservoir Leaping Well Brook South Hadley, MA MA 00586 March 5, 1981
CULLINAN ENGINEERING CO., INC. CIVIL ENGINEERS AUBURN-BOSTON, MASSACHUSETTS		

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

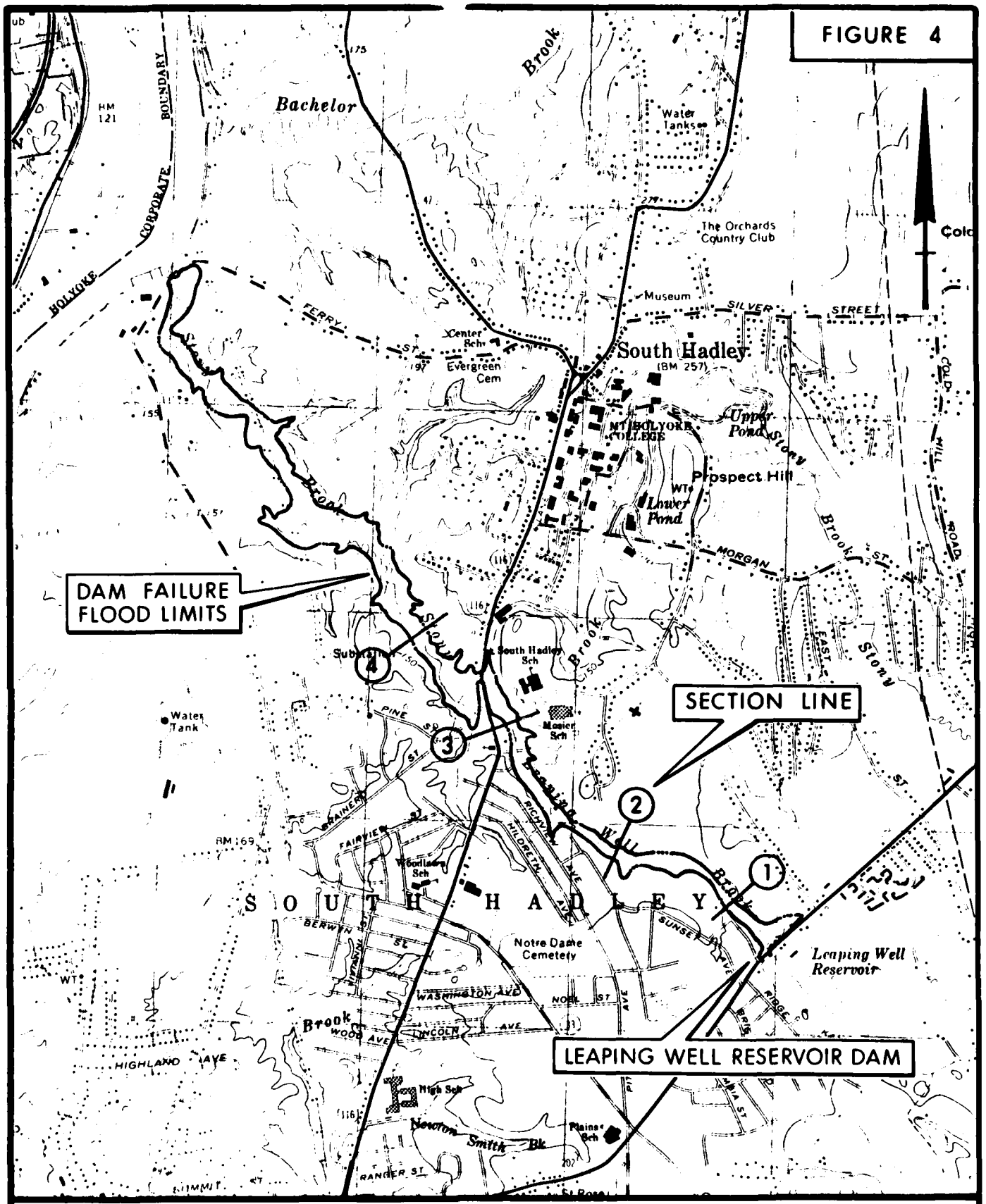
FIGURE 3



WATERSHED

LEAPING WELL RESERVOIR DAM
SOUTH HADLEY , MASS.
1" = 2083'

CULLINAN ENGINEERING CO., INC. SPRINGFIELD NORTH, MASS QUADRANGLE 1979



DAM FAILURE FLOOD LIMITS
LEAPING WELL RESERVOIR DAM
SOUTH HADLEY , MASS.
1" = 2083'

CULLINAN ENGINEERING CO., INC.

MT. HOLYOKE , MASS QUADRANGLE 1979
SPRINGFIELD NORTH , MASS QUADRANGLE 1979

CLIENT / PROJECT U.S. Army COE / Non-Federal Dams DATE 7/23/81 JOB NO. _____

SUBJECT: Leaping Well Reservoir Analysis and Evaluation BY GMV CHKD. BY KH SHEET 1 OF 13

I. Classification:

Size: storage (max.) = 140 Ac.Ft. ∴ Small
height (struct.) = 28.5 Ft. ∴ Small

Hazard Potential: if failure were to occur with the water surface at the top of the dam, hazard potential would be high due to the proximity of Rte. 202 and several businesses and homes

II. Spillway Design Flood:

With a high hazard potential and a small dam, the COE "Recommended Guidelines for Safety Inspection of Dams" indicates that a test flood in the ½ Probable Maximum Flood (PMF) to the full PMF range is appropriate.

∴ Determine SDF using full PMF due to the potential for a sizable economic loss and the possible loss of more than a few lives.

III. Inflow Hydrograph:

Tributary Area = 0.27 Sq. Miles
Terrain is Rolling (from inspection of USGS)
∴ From COE Guide Curve for "Maximum Probable Flood Peak Flow Rates"
M.P.F. = 2150 CSM (2 sq. mi. or less)

∴ PMF = 0.27 x 2150 = 580 cfs

Time to Peak $t_p = \frac{484AQ}{q_p}$ where A = drainage area = 0.27 sq. mi.
Q = runoff = 19.0 in. (PMP)
q_p = peak flow = 580 cfs

∴ $t_p = \frac{484 \times 0.27 \times 19.0}{580} = 4.3$ hrs. (257 min.)

Time Base $t_b = 2.67 t_p$

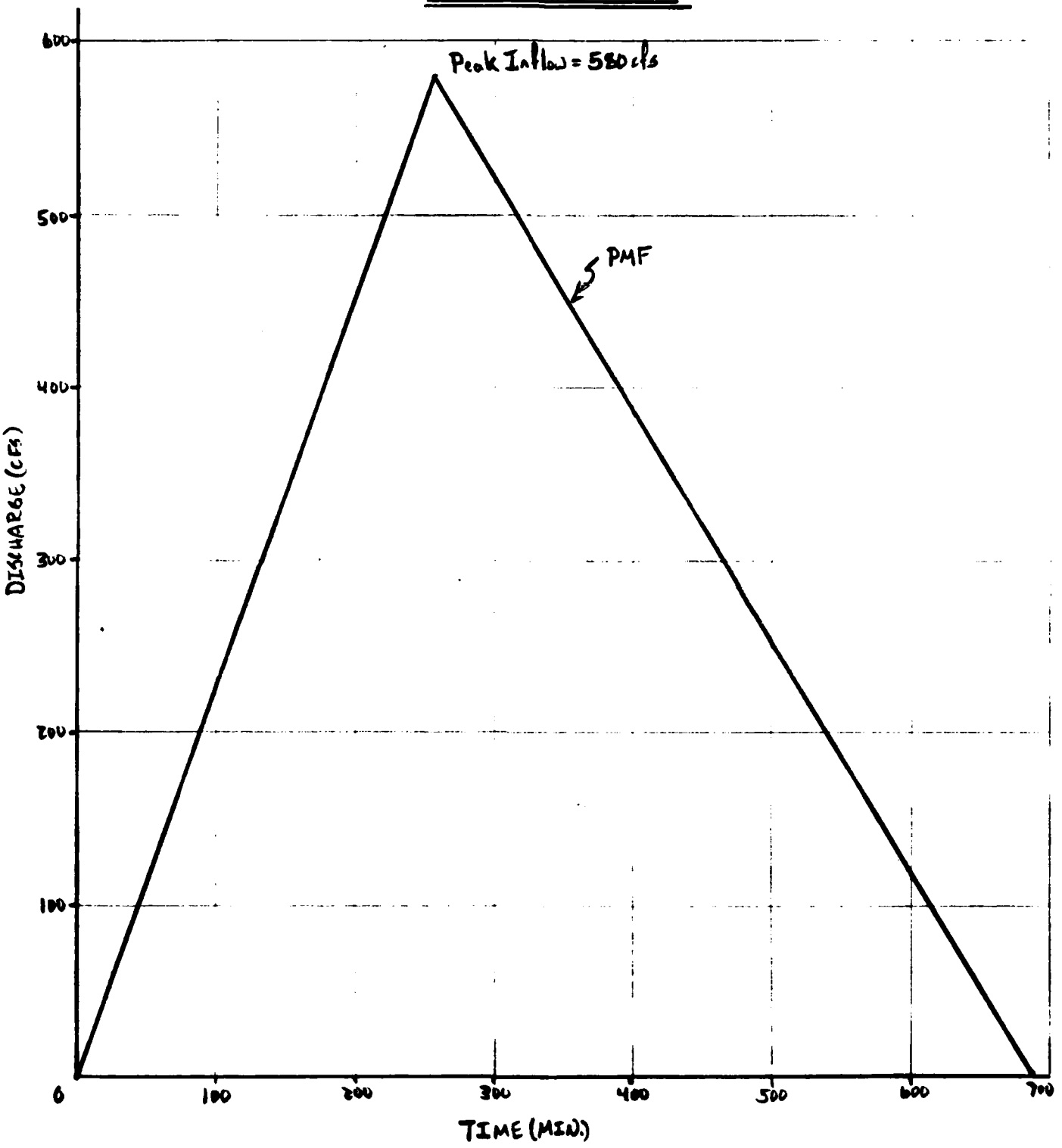
∴ $t_b = 2.67 \times 4.3 = 11.5$ hrs. (689 min.)

CULLINAN ENGINEERING CO., INC.
AUBURN · BOSTON, MASSACHUSETTS
CIVIL ENGINEERS — LAND SURVEYORS

CLIENT / PROJECT U.S. Army COE / Non-Federal Dams DATE 7/23/81 JOB NO. _____

SUBJECT: Leaping Well Reservoir Analysis and Evaluation BY GMV CHKD. BY KH SHEET 2 OF 13

INFLOW HYDROGRAPH



CULLINAN ENGINEERING CO., INC.
AUBURN · BOSTON, MASSACHUSETTS
CIVIL ENGINEERS — LAND SURVEYORS

CLIENT / PROJECT U.S. Army COE / Non-Federal Dams DATE 3/31/81 JOB NO.
SUBJECT Leaping Well Reservoir Analysis and Evaluation BY GMV CHKD BY JDP SHEET 3 OF 13

IV. Flood Routing:

Stage Discharge Data - The outlets that are still active consist of a 12" ϕ outlet (gated between the inlet and the outlet) which apparently discharges the inflow from the opening in the back of the structure and any seepage through the walls, and a 24" ϕ outlet (gate at inlet end not functioning, left open) which discharges the inflow from a 12" ϕ high level outlet located at the front of the gate structure. The pertinent elevations to be used to develop the stage discharge curve (from plan and field observations) are as follows: Inv. 12" ϕ outlet - 188.0 @ gate structure, 187.5 at outlet (Length = 380 ft.±); Inv. 24" ϕ outlet - 188.0 @ gate structure, 187.5 at outlet (Length = 160 ft.±); Inv. 12" ϕ inlet to gate structure 212.0; El. top of 478 ft. embankment = 216.0±; assume water surface at start of storm = 210.0 (normal level, from field obs.). 12" ϕ outlet, 12" ϕ inlet, 478 ft. embankment control.

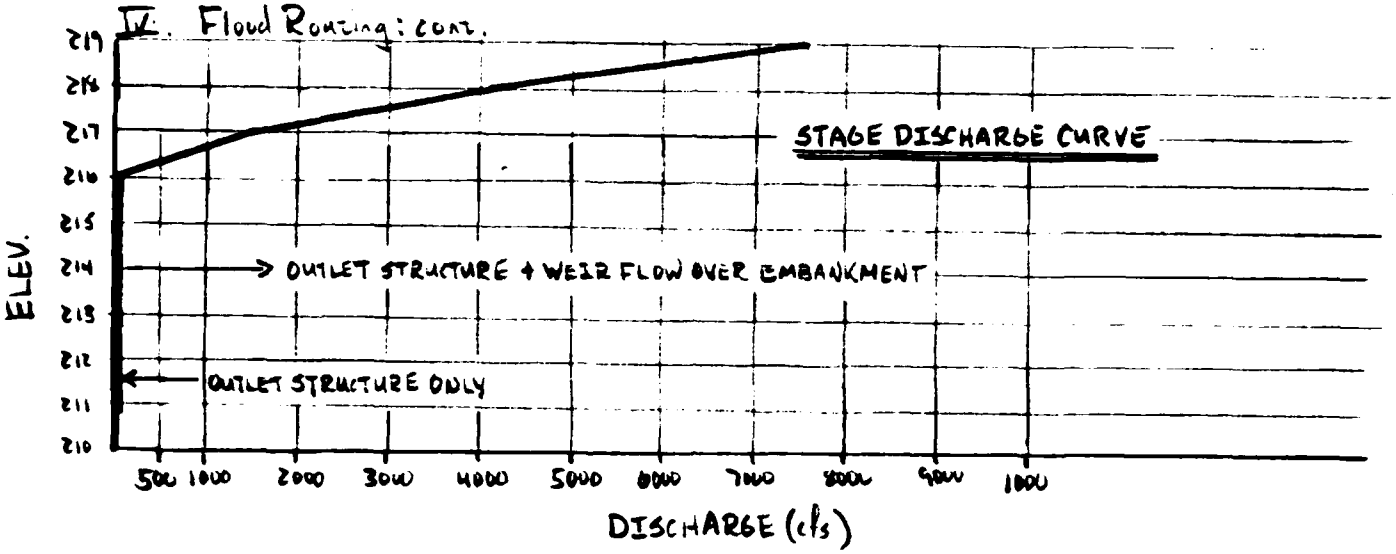
Discharge for 12" ϕ outlet given by $Q = \sqrt{2.31H}$ (Outlet Control, see HEC*5 pg. 5-6 note: H measured above outlet crown)

Discharge for 12" ϕ inlet given by Inlet Control Nomograph in HEC*5 (Chart 2, Scale 1)

Discharge for embankment given by $Q = 3.03 L H^{3/2} = 1448.34 H^{3/2}$

ELEV.	$H_{12"\text{OUTLET}}$	$H_{12"\text{INLET}}$	$H_{EMB.}$	$Q_{12"\text{OUTLET}}$	$Q_{12"\text{INLET}}$	Q_{EMB}	Q_{TOTAL}
211	22.5 ft.	—	—	7.2 cfs	—	—	SAY 7 cfs
212	23.5	—	—	7.4	—	—	7
213	24.5	1 ft.	—	7.5	2.2 cfs	—	10
214	25.5	2	—	7.7	4.5	—	12
215	26.5	3	—	7.8	6.0	—	14
216	27.5	4	—	8.0	7.0	—	15
217	28.5	5	1 ft.	8.1	8.0	1448 cfs	1464
218	29.5	6	2	8.2	9.0	4096	4113
219	30.5	7	3	8.3	10.0	7526	7544

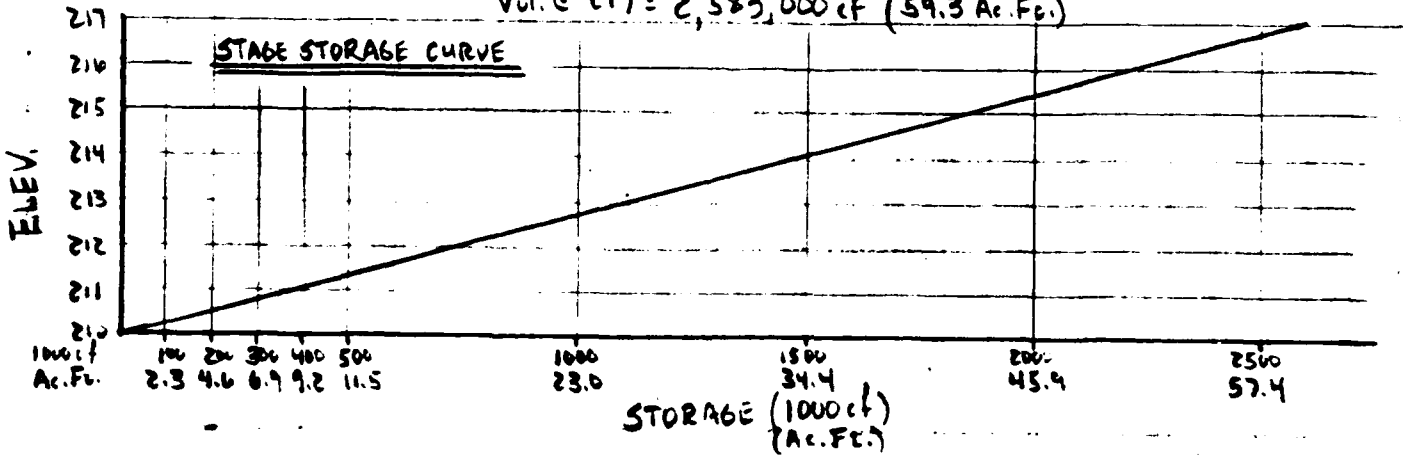
IV. Flood Routing: cont.



Stage Storage Data - Area of reservoir determined from USGS Springfield North Quad. Volumes computed assuming vertical sides on the reservoir.

Water Surface Area = 369,000 sf ±

∴ Vol. @ 211 = 369,000 cf (8.5 Ac. Ft.)
Vol. @ 212 = 738,000 cf (16.9 Ac. Ft.)
Vol. @ 213 = 1,107,000 cf (25.4 Ac. Ft.)
Vol. @ 214 = 1,476,000 cf (33.9 Ac. Ft.)
Vol. @ 215 = 1,845,000 cf (42.4 Ac. Ft.)
Vol. @ 216 = 2,214,000 cf (50.8 Ac. Ft.)
Vol. @ 217 = 2,583,000 cf (59.3 Ac. Ft.)



IV. Flood Routing; cont.

Peak Inflow = 580 cfs = Q_{P_1}
Total Rainfall = 19.0" (Probable Maximum Precipitation)

@ Q_{P_1} = 580 cfs
H = 6.4 ft. ± (el. 216.4 ±)
∴ V_1 = 3.8" Runoff = $STOR_1$

V_1 = 54.2 Ac. Ft.
Watershed Area = 173 Acres ±
∴ $V_1 = \frac{54.2}{173} \times 12 = 3.76$ inches of Runoff

$$\therefore Q_{P_2} = Q_{P_1}\left(1 - \frac{STOR_1}{19}\right) = 580\left(1 - \frac{3.8}{19}\right) = 465 \text{ cfs}$$

@ Q_{P_2} = 465 cfs
H = 6.3 ft. ± (el. 216.3 ±)
∴ V_2 = 3.7" Runoff = $STOR_2$

$$\therefore STOR_{AVG} = \frac{STOR_1 + STOR_2}{2} = \frac{3.8 + 3.7}{2} = 3.75"$$

$$\therefore Q_{P_3} = Q_{P_1}\left(1 - \frac{STOR_{AVG}}{19}\right) = 580\left(1 - \frac{3.75}{19}\right) = 466 \text{ cfs}$$

@ Q_{P_3} = 466 cfs
H = 6.3 ft. ±
∴ V_3 = 3.7" Runoff = $STOR_3$

$STOR_3$ = 3.7" ≈ $STOR_{AVG}$

∴ SAY PEAK OUTFLOW = 470 cfs
Elev. = 216.3 ±

IV. Flood Routing: cont.

The routing of the SDF indicates that a peak outflow of 470 cfs will occur at water surface elevation 216.3±. This represents the maximum expected water surface elevation as a result of the recommended Test Flood (Full PMF) and indicates overtopping of the dam by 0.3 ft.±.

V. Dam Failure Analysis:

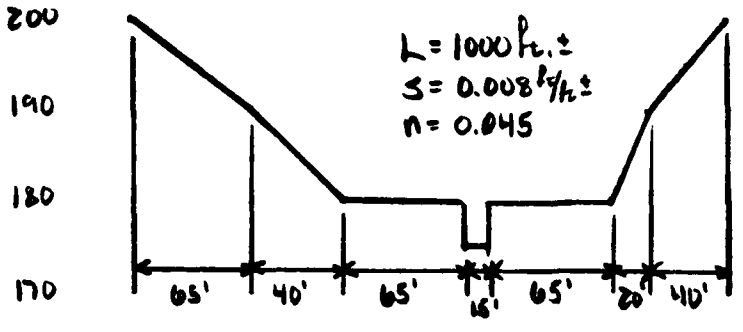
Field investigation indicates that if failure of the upper embankment were to occur, several homes and businesses would be damaged by the resulting outflow, however, in accordance with the guidelines established by the COE, it will be assumed, for purposes of analysis, that the entire embankment (including Rte. 202) fails. Since the dam is overtopped by the test flood and would, therefore, already cause flooding, fail with water at top of dam,

Dam height at Mid-Height = 140 ft.± (field observation)
Assume Breach Width W_b = 40% of Length at Mid-Height
$\therefore W_b = 0.40 \times 140 = 56$ ft.
WS Elev. @ Top of Dam = 216.0
Downstream Elev. = 187.5± (field observation)
$\therefore Y_o = 216.0 - 187.5 = 28.5$ ft.±
Peak Failure Outflow $Q_{p_1} = \frac{8}{27} W_b \sqrt{g}\, Y_o^{3/2}$

$\therefore Q_{p_1} = \frac{8}{27} \times 56 \times \sqrt{32.2} \times (28.5)^{3/2} = 14{,}325$ cfs (S = 144 Ac. Ft.±)
SAY 14,400 cfs

VI. Downstream Dam Failure Analysis:

① Section 1000 ft.± downstream of dam (from USGS) 1" = 100' Horiz. 1" = 20' Vert.



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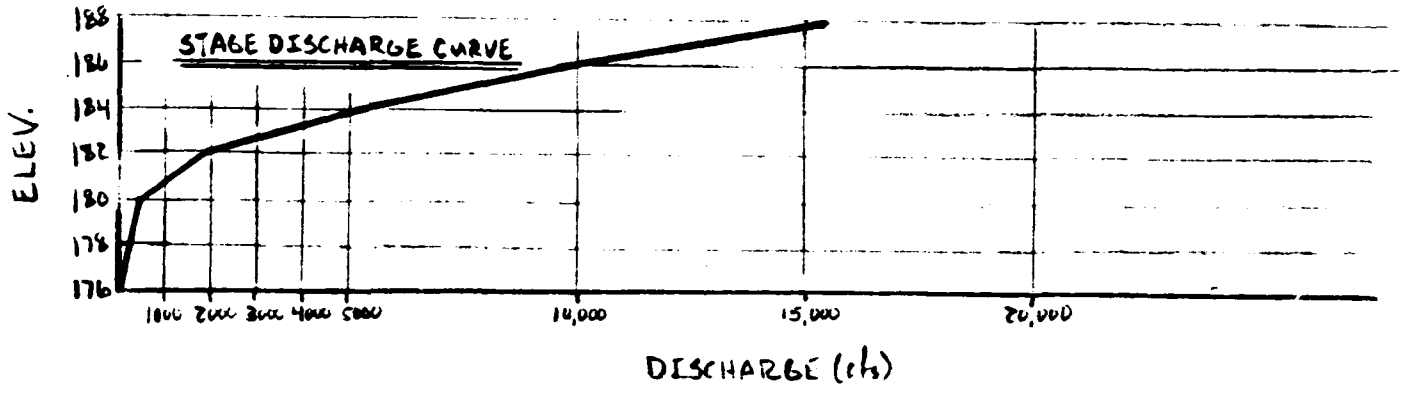
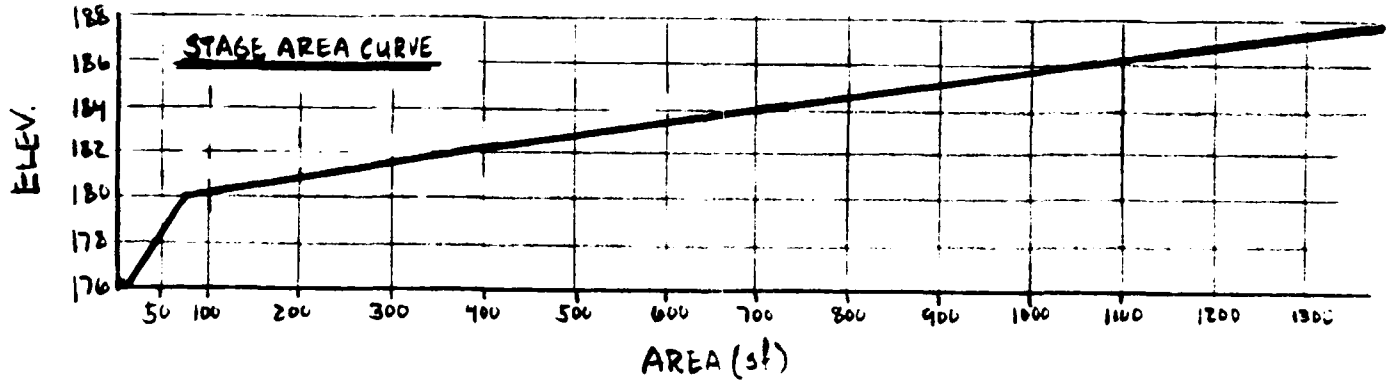
VI. Downstream Dam Failure Analysis: cont.

Elev.	Area	WP	Hyd. Radius	$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$
176	15 sf	17 ft.	0.88 ft.	41 cfs
178	45	21	2.14	221
180	75	25	3.00	461
182	377	167	2.26	1918
184	703	179	3.93	5171
186	1053	191	5.51	9702
188	1427	203	7.03	15,467
190	1825	215	8.49	22,433
192	2256	226	9.98	30,887
194	2729	237	11.5	41,066





VI. Downstream Dam Failure Analysis: cont.

@ $Q_{P_1} = 14{,}400$ cfs
$H_1 = 12.6$ ft. ± (El. 187.6±)
$V_1 = 1360 \times 1000 \times \frac{1}{43560} = 31.2$ Ac.Ft. $< \frac{1}{2} S$ ∴ Reach is OK

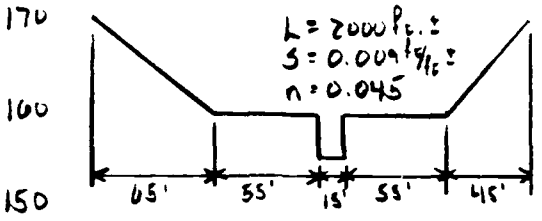
$\therefore Q_{P_2}(\text{TRIAL}) = Q_{P_1}\left(1 - \frac{V_1}{S}\right) = 14{,}400\left(1 - \frac{31.2}{144}\right) = 11{,}278$ cfs

@ $Q_{P_2} = 11{,}278$ cfs
$H_2 = 11.5$ ft. ± (El. 186.5±)
$V_2 = 1155 \times 1000 \times \frac{1}{43560} = 26.5$ Ac.Ft.

$\therefore V_{Avg} = \frac{V_1 + V_2}{2} = \frac{31.2 + 26.5}{2} = 28.9$ Ac.Ft.

$\therefore Q_{P_2} = Q_{P_1}\left(1 - \frac{V_{Avg}}{S}\right) = 14{,}400\left(1 - \frac{28.9}{144}\right) = 11{,}514$ cfs $\quad H = 11.6$ ft. ±, $A = 1170$ sf

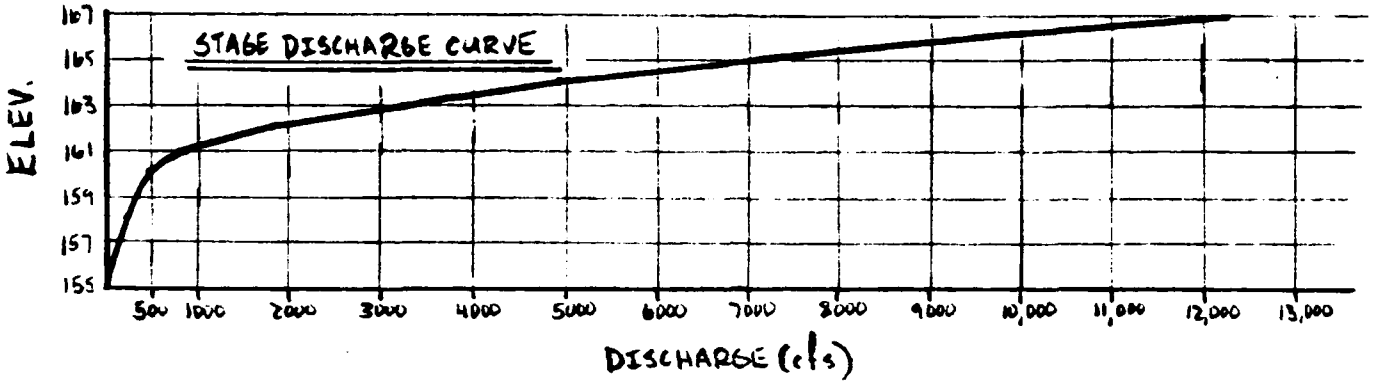
② Section 3000 ft. ± downstream of dam (from USGS) 1" = 100' Horiz. 1" = 20' Vert.

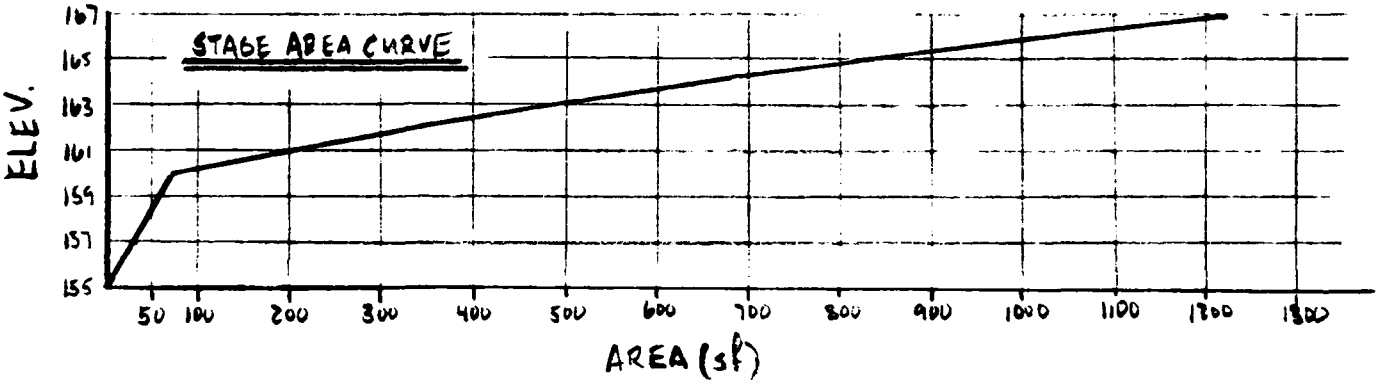


NOTE: If elevation exceeds 170±, flow will encroach upon a large flat area north of the brook.

Elev.	Area	WP	Hyd. Rad.	$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$
156	15 sf	17 ft.	0.88 ft.	43 cfs
157	30	19	1.58	127
158	45	21	2.14	234
159	60	23	2.61	356
160	75	25	3.00	489
161	206	146	1.41	811
162	347	157	2.21	1844
163	500	168	2.98	3244
164	663	179	3.70	4969
165	838	190	4.41	7060
166	1023	201	5.09	9483
167	1220	212	5.75	12,273

VI. Downstream Dam Failure Analysis: cont.





@ $Q_{P_2} = 11{,}514$ cfs

$H_1 = 11.7$ ft. ± (El. 166.7±)

$V_1 = \frac{1170+1165}{2} \times 2000 \times \frac{1}{43560} = 53.6$ Ac. Ft. $< \frac{1}{2} S$ ∴ Reach is OK

$\therefore Q_{P_3}(\text{TRIAL}) = Q_{P_2}\left(1 - \frac{V_1}{S}\right) = 11{,}514\left(1 - \frac{53.6}{144}\right) = 7225$ cfs

@ $Q_{P_3} = 7225$ cfs

$H_2 = 10.1$ ft. ± (El. 165.1±)

$V_2 = \frac{1170+850}{2} \times 2000 \times \frac{1}{43560} = 46.4$ Ac. Ft.

$\therefore V_{AVG} = \frac{V_1+V_2}{2} = \frac{53.6+46.4}{2} = 50.0$ Ac. Ft.

$\therefore Q_{P_3} = Q_{P_2}\left(1 - \frac{V_{AVG}}{S}\right) = 11{,}514\left(1 - \frac{50}{144}\right) = 7517$ cfs H = 10.2 ft. ± A = 875 sf ±

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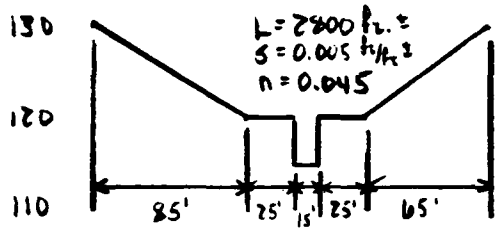
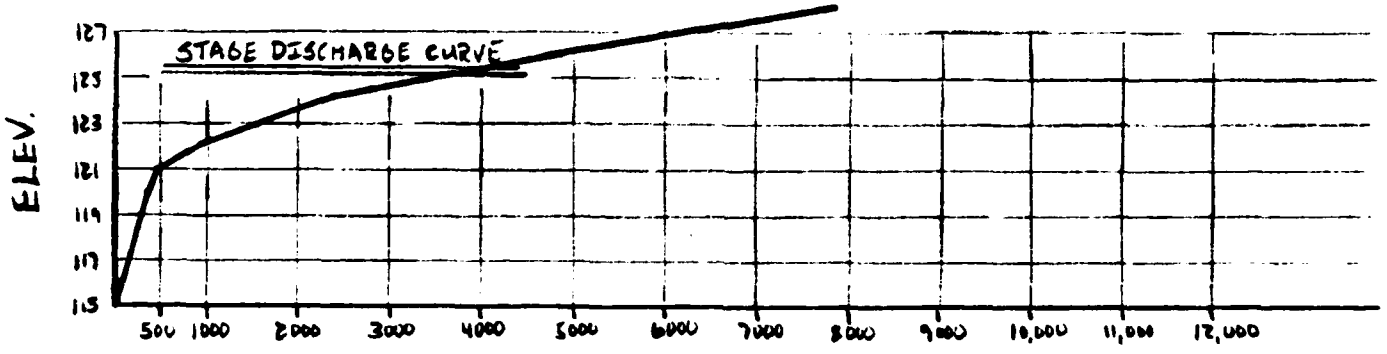
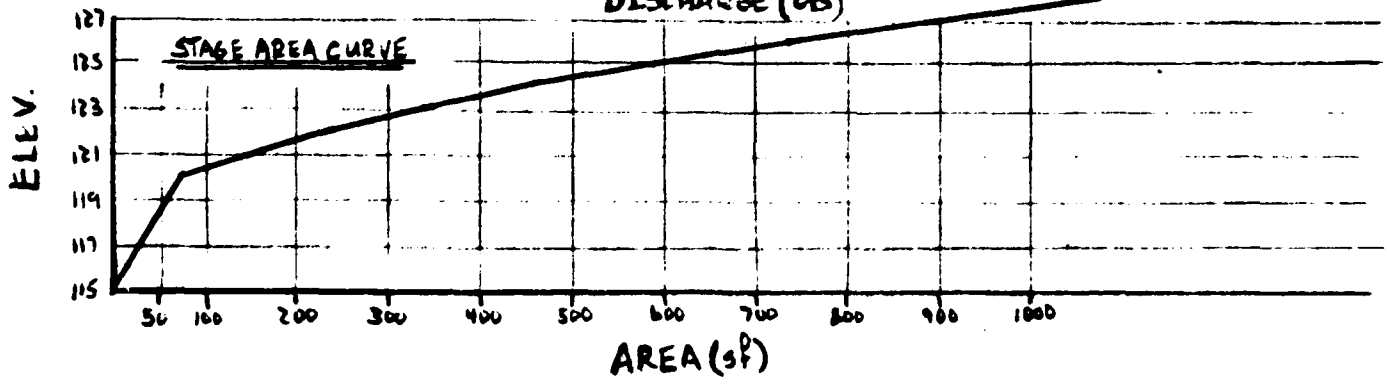
VI. Downstream Dam Failure Analysis: cont.

③ Section 5800 ft.± downstream of dam (from USGS) 1" = 100' horiz. 1" = 20' vert.



Elev.	Area	W	Hyd. Rad.	$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$
116	15 sf	17 ft.	0.88 ft.	32 cfs
120	75	25	3.00	364
121	148	90	1.64	481
122	235	105	2.24	934
123	338	120	2.82	1575
124	455	135	3.37	2388
125	588	150	3.92	3413
126	735	165	4.45	4643
127	898	180	4.99	6123
128	1075	195	5.51	7830





VI. Downstream Dam Failure Analysis: cont.

@ $Q_{P_3} = 7517$ cfs
$H_1 = 12.8$ ft.± (El. 127.8 ±)
$V_1 = \frac{875+1045}{2} \times 2800 \times \frac{1}{43560} = 61.7$ Ac.Ft. $< \frac{1}{2} S$ ∴ Reach is OK

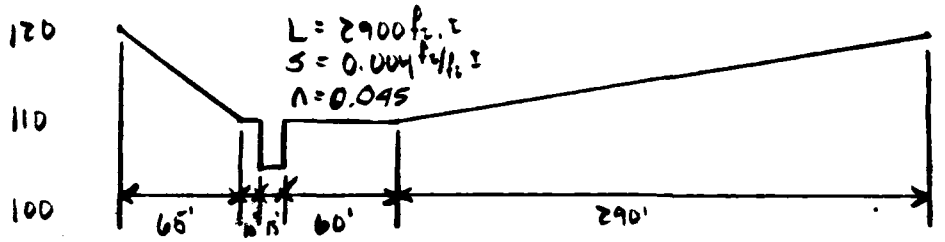
∴ $Q_{P_4}(\text{TRIAL}) = Q_{P_3}\left(1 - \frac{V_1}{S}\right) = 7517\left(1 - \frac{61.7}{144}\right) = 4296$ cfs

@ $Q_{P_4} = 4296$ cfs
$H_2 = 10.7$ ft.± (El. 125.7±)
$V_2 = \frac{875+695}{2} \times 2800 \times \frac{1}{43560} = 50.5$ Ac.Ft.

∴ $V_{AVG} = \frac{V_1 + V_2}{2} = \frac{61.7 + 50.5}{2} = 56.1$ Ac.Ft.

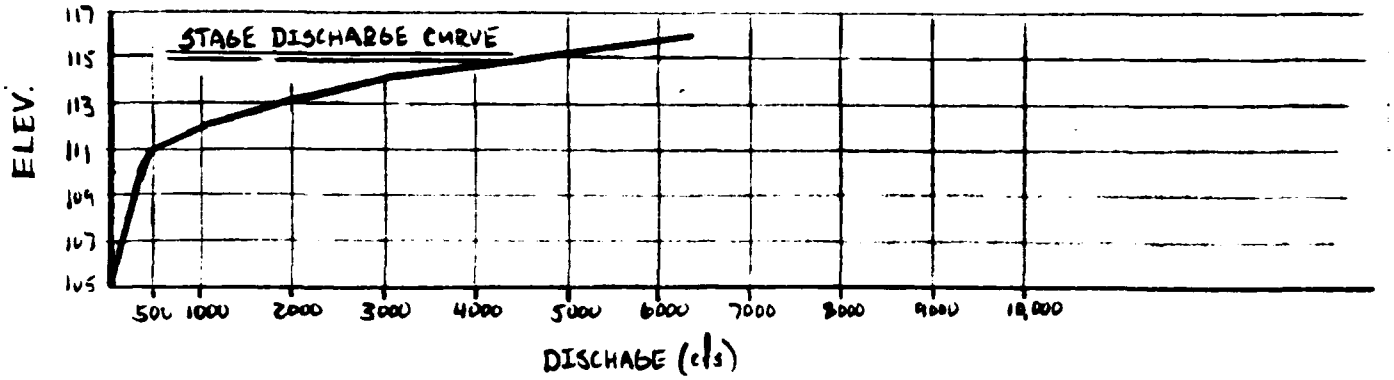
∴ $Q_{P_4} = Q_{P_3}\left(1 - \frac{V_{AVG}}{S}\right) = 7517\left(1 - \frac{56.1}{144}\right) = 4589$ cfs H= 11.0 ft.±, A= 730 sf±

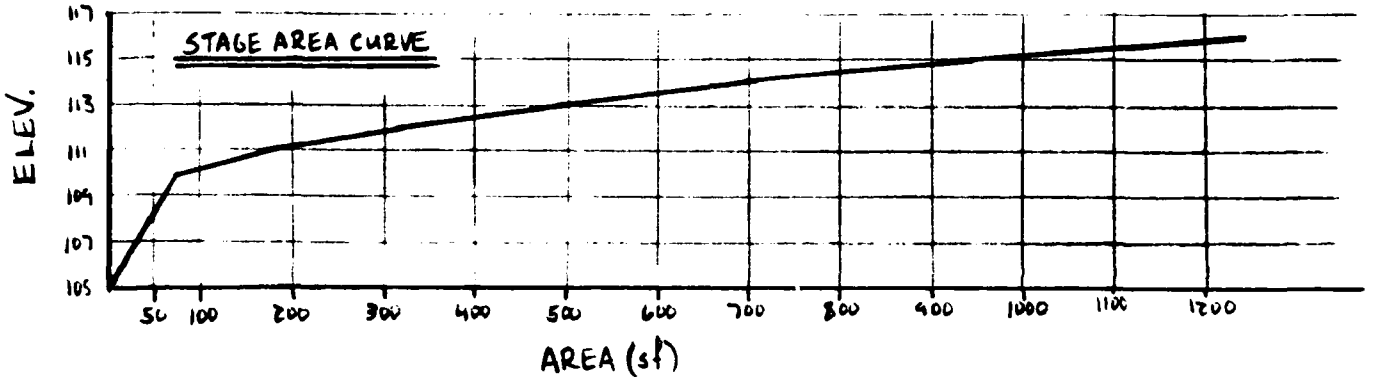
④ Section 8700 ft.± downstream of dam (from 1565) 1"= 100' Horiz. 1"= 20' Vert.



Elev.	Area	WP	Hyd. Radius	$Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$
106	15 sf	17 ft.	0.88 ft.	29 cfs
107	30	19	1.58	85
108	45	21	2.14	156
109	60	23	2.61	238
110	75	25	3.00	326
111	178	131	1.36	456
112	316	167	1.89	1009
113	490	203	2.41	1840
114	699	239	2.92	2982
115	944	275	3.43	4484
116	1224	311	3.94	6377

VI. Downstream Dam Failure Analysis: cont.





@ $Q_{P_4} = 4589$ cfs

$H_1 = 10.1$ ft. ± (El. 115.1 ±)

$V_1 = \frac{730+960}{2} \times 2900 \times \frac{1}{43560} = 56.2$ Ac. Ft. $< \frac{1}{2} S$ ∴ Reach is OK

∴ $Q_{P_5}(\text{TRIAL}) = Q_{P_4}\left(1 - \frac{V_1}{S}\right) = 4589\left(1 - \frac{56.2}{144}\right) = 2797$ cfs

@ $Q_{P_5} = 2797$ cfs

$H_2 = 8.8$ ft. ± (El. 113.8 ±)

$V_2 = \frac{730+665}{2} \times 2900 \times \frac{1}{43560} = 46.4$ Ac. Ft.

∴ $V_{AVG} = \frac{V_1 + V_2}{2} = \frac{56.2+46.4}{2} = 51.3$ Ac. Ft.

∴ $Q_{P_5} = Q_{P_4}\left(1 - \frac{V_{AVG}}{S}\right) = 4589\left(1 - \frac{51.3}{144}\right) = 2954$ cfs $H = 9.0$ ft. ±

VI. Downstream Dam Failure Analysis: cont.

Approximately 7000 ft. downstream of the last section taken, the brook (Stony Brook) runs into the Connecticut River where the remaining peak failure outflow would be attenuated. No homes or other structures of any importance are known to exist in that stretch. It is assumed that the average depth of flow in the final reach will be approximately 8 feet.

Analysis of the downstream impacts due to dam failure indicate that approximately 5 homes and businesses would be subject to flooding in the event of a failure of the entire embankment. Should the upper embankment only fail (this is considered to be more likely), as many as 7 homes and businesses may be affected, therefore, the hazard potential is considered to be "High".

Flow depths in the downstream channel prior to, and following, failure of the dam are as follows:

Section	Entire Embankment	
	Pre-Failure Depth 15 cfs (outflow with water at top of dam)	Depth Following Failure Flow Varies
1	0.4 ft.± (El. 175.4±)	11.6 ft.± (El. 186.6±)
2	0.3 ft.± (El. 155.3±)	10.2 ft.± (El. 165.2±)
3	0.5 ft.± (El. 115.5±)	11.0 ft.± (El. 126.0±)
4	0.5 ft.± (El. 105.5±)	9.0 ft.± (El. 114.0±)

Examination of the USGS sheets indicate that, in the downstream channel, no damage would occur at the pre-failure level but that 5 buildings may experience flow depths of 5 ft. to 10 ft. following failure. Also, Rte. 116 would be overtopped by 5 ft.±.

Should the upper embankment only fail, 7 homes and businesses on Rte. 202, which were not receiving any flow prior to failure, would be inundated by, approximately, 2 to 4 feet of water following failure.

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

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